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Power of the Ocean Tides.

(SECOND ARTICLE.)

On page 9 of volume VIII. of this journal, in discussing the above subject, we closed with the remark that the method of utilizing the tides would be discussed hereafter. The facts stated there, and the result of the calculations arrived at, have since been extensively copied and commented upon in many scientific papers, in Europe as well as on this side of the ocean. The latest news in regard to inventions brings in the information that Mr. M. F. TOMMASI has patented in France and elsewhere, a method to utilize this power, by a very peculiar and rather roundabout arrangement of air-tight chambers, connected with air-pump cylinders, and which he calls "Le Flux Moteur." An abstract of the memoir published by him, and the required figures, we have taken from *Van Nostrand's Eclectic Engineering Magazine.*

FIG. 1 represents level of low water; C, level of high water; F, the lower, and G, the upper reservoir; MM, horizontal position dividing the two reservoirs; D, inlet tube of water into lower reservoir; H, pipe from bottom of lower to bottom of upper reservoir; I, pipe to motor apparatus; O, cylinder of motor; P, pump; K, pipe connecting with the discharge pipe of motor apparatus.

In FIG. 2, A is the pipe connected with the sea, flush with low tide; B, pipe communicating with upper section; C, level of low water; FFM, horizontal partition; I, pipe to motor apparatus; K, pipe connecting with discharge pipe; M, manometers to ascertain the pressure or vacuum; N, tubes connecting the several reservoirs.

In FIG. 3 is represented the manner of building and placing the reservoir, of which more hereafter; while in FIG. 4 the system of motor cylinders is represented.

If the water of the sea is conducted into a reservoir by means of a horizontal tube set at the main level of low water at the spring tide, the bottom of the reservoir being at the same level with the tube, and its top being at a level with the base of the *unit of height* of the tide (A B D F, FIG. 1), it is obvious that this reservoir will always contain water, and that its level, rising with the sea, will be at its extreme height when the sea is at the mean of its ascent, provided that there is a suitable orifice of discharge for the air which fills the reservoir, so that it can escape when the water enters. But if, on the contrary, this reservoir is closed, the enclosed air, in preventing the water from rising, will suffer a pressure proportional to the relative height of the sea. It follows that, by connecting the upper portion of the reservoir with a motive apparatus, by means of a tube, the piston will be driven with a force proportional to its area and the tension of the air—a tension proportional to the weight due to the charge of sea water. By making the area of the piston proportional to the work required, and the tension of the air at the time the level of the sea has reached a certain point, it will result that from this point to the limit of the flood height, the piston will always move with the same force, since the reservoir level rises with the sea level; and, the difference always being the same, the pressure of air and the work resulting will be constant. If, during the operation of the motor, the water from the sea freely enters a reservoir placed above the other, having its upper surface at the height of spring tide (C H M, FIG. 1), and if the plug is closed, when this reservoir is filled, the ebb will leave it full of water, and when the sea has sunk so far that, relative to its maximum level, it has the same head as it had at first relative to its minimum level, the work of the water suspended in this reservoir is equal to the work of the sea-water when it had risen to the given point. Now, by connecting the upper portion of the reservoir by means of a tube with the discharge pipe, the external air, in entering, will drive the piston with a force proportional to its area, and to the rarefaction produced on the other side by the weight of the descending water. Since this weight is equal to that which has compressed the air in the other reservoir, it is equal to the pressure of the external air. From this time to the end of the reflux, the piston will move with the same force, since reservoir level and sea level descend alike, and the difference being constant, the pressure of the air, and hence the power generated, will be constant. Now, if before the work ceases, which happens when the upper reservoir is empty, the valve at the upper portion of the lower reservoir communicating with the air is opened, the water will descend with the sea level. When the tide rises, the valve is closed, and the operation is repeated.

In using the apparatus described above, each period of work must be followed by one of repose. The hours of work vary with each day, and hence the motor is suited to those industries only in which it is not necessary to have steady power; for example, in machines for raising water, saw-mills, etc., when steady power is desired, the apparatus is modified. Another reservoir added as a storage reservoir (*cloche de réserve*), and pumps are used to condense air. This is operated when men are off work, (as in the night and on Sunday); and by means of these pumps it fills the storage reservoir with condensed air. If the tide has not reached a point suitable for direct application of its work, power can be obtained from this tide-motor by stopping all of the pumps and one of the cylinders, and making connection with the storage reservoir. This will furnish condensed air for work until the tide has turned so as to furnish its power direct.

The reservoir is of wood, braced with oak and securely hooped. Its wall is of pitch-pine plank, and saturated with tar. The height of the cylindrical portion should be about half a metre more than twice the height of the *unit of tide.* The horizontal partition should be half a metre above the middle of the cylinder.

The diameter theoretically depends upon the amount of pressure required; but it would be convenient to establish a constant diameter of say twenty metres; as this gives great capacity without difficulty of construction, and the fixed dimensions would cheapen further constructions.

When the reservoir is finished, it is launched and towed to its station. A bed, E, twenty-three metres wide, starting at the level of the highest tide, and extending toward the sea, so far that its lower level is horizontal, is dug in the sand, to a depth equal to the draught of the reservoir. This should be dug at ebb tide. At flood, the reservoir is moved to its place, F. At low tide, a trap is opened in the ceiling, workmen descend, and, taking up the floor, (not yet fastened), pass out the sand toward the sea side, so that the reservoir becomes

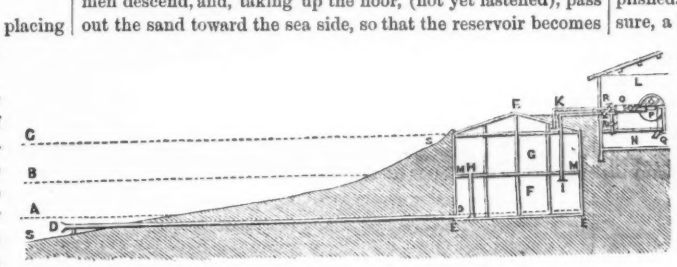

Fig 1.

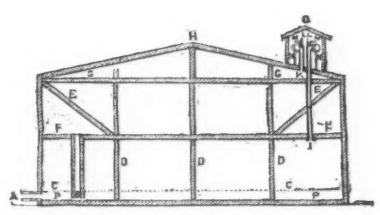

Fig. 2.

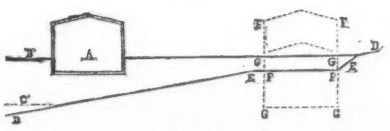

Fig. 3.

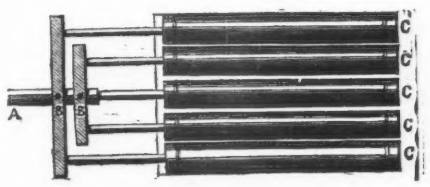

Fig. 4.

firmly fixed. When the base has reached the point G, the flooring is replaced and calked.

A trench is now dug seaward, half a metre below mean low-tide level, in which is laid a red cedar pipe, bound with wire hoops, gutta-percha coated, with joints of oak. This tube is so disposed that the sea end is above the bottom; but it is never out of water, so that the sand cannot choke it. Notwithstanding this precaution, should this happen, the slight inclination will cause the tube to be scoured out at each ebb; or the reservoir can be discharged for this purpose.

The pipe, being set, is covered with sand; the planks of the horizontal partition are set and calked; the vertical tube from the upper chamber is placed; the reservoir is closed hermetically; connection is made with the motive apparatus, and the motor is ready to do work.

Certain peculiarities of construction in the motive apparatus are necessary. (1.) The dimensions of the cylinder should be large, because of the low pressure on the piston. (2.) A regulator would obviously be useless. (3.) The stop-cocks are of a kind specially adapted for this purpose. In order to transform the intermittent motive force into a continuous work, it is only necessary to have an air-tight storage reservoir large enough to furnish the motive power during the time when the tide cannot work directly.

The compresso-motor apparatus should have two cylinders. The piston rod should drive directly five pistons. The two cylinders of the motor-pistons and the ten pumps should be of double effect. Upon the rod of the two motor-pistons is fixed the cam for transmitting the motion to the crank. The fly-wheel for regulating the motion should be of great size and little weight. Each group of five pistons should be divided into two couples and one independent piston, so that the number at work can be regulated. Each pump should be supplied with two stop-cocks, by means of which communication may be made with the storage reservoir or with the external air. The motor pistons should be set so as to be detached from the crank, so that the motive apparatus can be worked without the pumps. The apparatus will be more clearly understood by reference to the illustrations.

The inventor claims that the tide-motor will, for obvious reasons, cheapen manufactured products; that the compressed air can be conveyed for use to great distances by means of pipes; that the power is uniform and constant; that it is free from danger; and that it affords the advantages sought for in attempts to invent a perpetual motion.

One objection to this arrangement is, as before stated, the roundabout way in which the object is attempted to be accomplished. By using air pressure in place of direct water pressure, a large portion of the latter is lost by the compressibility of the air, which will cause the difference in the water-level to become less, than would be the case if an intervening substance, not so highly elastic, were used. If we add to this the utter hopelessness of keeping such large air reservoirs perfectly air tight at the top for any length of time, and the enormous expense of their construction, (a very large sum being required in order to give power for any available period of time), we come to the conclusion that other and simpler methods must be found to utilize the power of the ocean tides.

Polytechnic Club of the American Institute.

Meeting held at the Rooms of the Association, March 17, 1870, Professor S. D. TILLMAN in the Chair.

MR. C. D. ANDERSON explained the action of Prof. AINSLEE-LAFFON'S Planometer, an instrument for measuring the areas of irregular areas, as indicator cards, section, and in fact any irregular figure. It does it in a purely mechanical manner, without any calculation whatever. Mr. EMORY spoke of the advantage it would be in railroad work, and to engineers or surveyors having land to measure.

Mr. L. M. WINN, of this city, exhibited and explained a "Champooing Helmet," by the use of which the collar, dress, and face are entirely protected from the water, while the person may at the same time sit in an upright position, perfectly at ease. It consists of a large tin vessel, the bottom of which is formed of elastic rubber. The rubber is so made with an opening in it as to close around the head, just at the edge of the hair, and make a water-tight joint. A rubber collar protects the collar beneath from any stray drops.

Mr. CHAS. NEER presented a new rotary dynamometer, which he explained, and pointed out a new application of the same for testing of oils, and lubricating substances in general. A connecting apparatus attached registered the number of revolutions made by the shaft, while the dial-plate gave the exact amount of power used in performing them.

Mr. JOHN JOHNSON, of Saco, Maine, presented an apparatus for illustrating the theory of wave-motion and vibrating nodes. It consisted of a number of small cords with a shot at the end of each. These cords were suspended from horizontally revolving discs, and were attached at different distances from the centres. When the discs were rapidly revolved, the cords gathered themselves up into hour-glass shapes, or almost into globular forms, according to the weight of the strings, speed, distance from centre, etc. Photographs have been taken of these revolving cords, which can thus be studied at leisure, and, as it were, in a state of rest. The apparatus differed materially from that presented to the club some time since.

Steam Boilers, the regular subject for discussion, was then taken up.

Mr. COLEMAN said that, starting from the grate-bars as a beginning, the first point to be obtained was perfect combustion, and time was an important element in this, too frequently neglected. He did not think it best to cool the fire-box with water-legs, etc., until the hot gases were thoroughly combined with the requisite amount of heated air necessary to complete

combustion, therefore he would have his fire-box lined with fire-brick, and take the heat out of the gases when they were no longer combustible. Gases may show a very low temperature in the smoke-stack, and yet the chemist might find dollars in them. He would not cool the fire-box too quickly. There were many opinions about boiler explosions, but the speaker thought that explosions occurred only from over pressure of steam in boilers too weak to hold it. The evils of poor firing were then mentioned, and the ruinous waste that an ignorant fireman could produce, was strongly shown. Inadvertently in last week's report, Mr. ROOT's remarks on circulation in boilers were attributed to Mr. COLEMAN, who holds opinions diametrically opposite.

Mr. ROOT spoke of the fact that a boiler which forms steam upon its fire surface always deposited scale, and contended that the only way by which it was possible to avoid this, was to keep a current of water flowing across fire surfaces rapidly enough to abstract the heat without forming steam in contact with the plates.

The discussion then turned upon the relative merits of different boilers, their defects and advantages.

The subject will be continued at the next meeting.

Civil Engineering and Public Works, as Represented at the Paris Exposition.

From the Report of Prof. W. P. BLAKE, Commissioner of California.

EXTENT OF THE EXHIBITION IN CLASS SIXTY-FIVE.

CLASS sixty-five of the Exposition included "Civil Engineering, Public Works, and Architecture." It is not proposed to give in these pages a full and comprehensive report upon this class. The design has been especially to notice the exhibition, by the Board of Public Works of Chicago, of the plans and details of the Chicago lake-water tunnel, of which no adequate description appears to have been given in the reports upon the Exposition. In addition, a few of the notes upon some of the other important and striking exhibitions in the same class have been written out and amplified by the aid of publications received since the close of the Exposition. Some departments of the subject have already been noticed in more or less of detail in the other reports of this series. For example, the increasing use of Coignet's agglomerated béton in construction, and the methods of paving in Paris with asphalt and with bitumen, have been carefully described in the reports made by Messrs. LEONARD and ARTHUR BECKWICK. Some observations upon the railways of France will be found in the general report, and some of the building materials are noticed in the report by Commissioner BOWEN. An adequate notice of the extremely rich and varied display of materials used in the construction of great public works would alone form a volume far exceeding the limits allowed for this memorandum. Such materials include not only all varieties of stone, from granite to the ornamental marbles, but mortars, cements, artificial stones, bricks, and tiles, cast and wrought iron in various forms, zinc and other metals, wood, etc.

Very interesting and valuable reports have been made by the French and British commissions upon all these materials. One by Prof. DELESSE will be found in Tome X of the Reports of the International Jury; one by Captain PONSONBY COX, R. E., upon "Civil Engineering," in Vol. IV of the British Reports; and upon "Limes and Hydraulic Cements," by Lieutenant Colonel SCOTT, R. E., in the same volume. Roads and bridges, and internal navigation, foundations, and various special engineering operations have been elaborately reported upon by BARON E. BAUDE, of the International Jury.

Exhibition of Models and Drawings by France.—The most complete and comprehensive exhibition in this class was made by the minister of public works of France. It was unrivaled for its extent, interest, and value, and included models, on a large scale, of bridges, canals, forts, docks, light-houses, etc., and was accompanied by complete drawings and explanations. Some of the most striking of these objects were the model of the great arched bridge at St. Sauveur, the Napoleon bridge in the High Pyrenees, (scale 1-25th.) the foundations of Fort Chavagnac at Cherbourg, and the light house de la Blanche, with sections showing in detail the arrangement of the interior.

In regard to the excellence of the representations of civil engineering in the French section, and the general inadequacy of the exhibition from other countries, Captain PONSONBY COX, R. E., observes as follows:

"Although there is no science which has given to the world such important practical results within the last few years as that of civil engineering, and though there is probably none which has made more real scientific progress, its recent progress and later results are far from being adequately represented in the Exposition of 1867.

"In the French section only is there a satisfactory exhibition in engineering proper; the other European nations, as well as the United States of America, are but slightly represented; our own country can hardly be said to be represented at all. This is much to be regretted, for undoubtedly a well-assorted collection of models or drawings of the most important engineering works scattered all over the world, which are due to the energy and skill displayed by English engineers within the last few years, would, if placed side by side with the magnificent collection of models and plans in the French section, have formed an exhibition most interesting and instructive, and would have added much to the available knowledge of the civil engineering of the world, and saved much of the labor thrown away in re-inventing. From this point of view the Paris Exposition cannot but be looked upon as a great opportunity lost. The public works of London alone might have supplied admirable examples in the great railway stations and river bridges recently constructed, as well as the works connected with the main drainage and the Thames embankment. The materials for a good display exist, no doubt, in the works of Great Britain and her colonies, but we do not possess, (nor does any other nation possess,) for tabulating these materials, such a machinery as France has in her establishment 'des Ponts et Chaussées,' her 'École des Mines,' 'des Arts et Métiers,' etc."

Progress since 1855.—Baron BAUDE, member of the Committee of Admission of Class 65, who prepared the introduction to the class catalogue, points out among the principal technical improvements realized since 1855: 1. The progress made in the trades of hydraulic lime, cements, artificial stones, potteries, slate, and asphalts, and in that of hammered metal applied to the preservation and decoration of roofs. 2. The increase in the use of metal structures, which are more and more appreciated every day. 3. The increase in the number of machines employed in working wood for joiners and other work. 4. The constantly increasing application of compressed air in places deep and difficult of access. 5. The ingenious methods of lifting heavy bridges, viaducts, and other metallic works. 6. The new system of movable dams. 7. The recently invented and powerful dredging apparatus. 8. The application of electricity to light-houses, and the new combinations made with a view to assist navigation, among which may be reckoned the creation of a system of coast semaphores.

Public Works of Spain.—A very interesting exhibition of models of the principal public works of Spain was made by the Board of Direction of Public Works, and was accompanied by a memoir giving a short notice of each model and a general notice of the condition of the public works in Spain, and of the special laws and regulations under which they are executed.* The collection contained numerous models of light-houses, models of machines and wagons used in the construction of the port of Grao de Valencia; models of the port of Tarragona; of the jetties of the port of Corogne; of the Sima aqueduct upon the canal of ISABEL II; and of various bridges, reservoirs, aqueducts, and machines used in the execution of extensive public works. It was also accompanied by six volumes of photographs of the most remarkable public works of Spain.

II.—MATERIALS FOR CONSTRUCTION.

Granites, Porphyries, Jaspers, and Marbles.—Among the hard stones worked in France are the syenites, granites, and porphyries of the Vosges, the green melaphyre of Tournay, the granites and protogines of Mont Blanc. The jaspers of St. Gervais, near Mont Blanc, are attracting much attention for their beauty and novelty. The quantity is supposed to be inexhaustible, and blocks of large size are obtained. The rock is believed to result from the metamorphism of a bed of sandstone of the Triassic period. It is banded and brecciform in structure, and presents a great variety of colors most capriciously mingled, the most conspicuous being blood-red, rose, and green. It is traversed by veins of white quartz. These beautiful jaspers were represented at the Exposition by two splendid columns at the entrance of the glass-house for the equatorial plants. Similar columns have been placed in the new opera house. The cost of the stone is 1,500 francs the cubic metre at the quarry, and 2,000 francs delivered in Paris, but it is supposed that when the quarry is fully opened the price will be reduced.

Of marbles, France has a bountiful supply. They are obtained chiefly in the Vosges, the Alps, and Pyrenees, and from Boulogne and the Jura. Quarries at the last-named locality are regularly worked on a large scale, and blocks are furnished at low prices. The French section contained a great many beautiful marble columns designed for the new opera house. The marbles came from the quarries of Sarrancolin (Hautes-Pyrenees), St. Beat (Haute-Garonne), Félines (Hérault), St. Antonin (Bouches-du Rhone), Porcieux (Var), Jeumont (Nord). According to the French customs returns, the exportation of French marble, which was valued at only 350,405 francs in 1855, constantly increased until the value had reached 1,140,279 francs in 1866. The importation of marble has also increased regularly during the same time, being valued at 1,038,271 francs in 1855, and at 2,357,115 francs in 1866. The disposition to use marble in construction is increasing in France.

The following figures show the prices in francs per cubic metre of the marbles most in use in France during 1867. These figures, and the preceding relating to the marble industry of France, are compiled from the report of Prof. DELESSE:

Sarrancolin	1,012
Campan mélangé and Campan vert	1,232
Rose clair	792
Griotte d'Italie	1,012
Griotte œil de perdrix	1,117
Languedoc	792
Brèche impériale	682
Vert de Maurin (serpentine)	1,122
Brocatelle jaune, violette ou jaune fleurie	847
Sarrancolin de l'ouest	572
Henriette	627
Noir française	374

The display of marbles from Italy was peculiarly fine, remarkable alike for the beauty of the material and for the liberality and taste displayed in the selection of the specimens. They were in blocks a foot square and beautifully polished. The Institute Technico de Firenze also sent a splendid series of specimens of all varieties of the Italian building stones, among them a series of sixty polished blocks of serpentine of as many different shades and colors.

From Algeria there was a fine collection of some four hundred specimens, in cubes measuring six inches on a side, of the building stones of that country. These were collected by the "Service du genie militaire: des ponts et chaussées." The series contained a great variety of marbles, among them the beautiful light-colored "onyx marble," so-called, now much prized and used for interior decoration in France.

Belgium is extremely rich in marble of various colors, particularly the much esteemed black marbles. They are obtained in the provinces of Namur, Liege, and of Hainaut. Of the black marbles, these of Denée and of Furnaux are much exported to France, Germany, and Italy. The fine black marble of Golzinnes is nearly all sent to Paris. The black marble from the quarries of Peruwelz and of Basécles (Hainaut) is very solid, and exported in considerable quantities to all parts of Europe and to America.

There are ninety marble quarries in the province of Namur; they employ nearly eight hundred and six men, and the value of the annual production is estimated at eight hundred and sixty thousand francs. The quarries of Wellin yield nearly four hundred cubic metres of marble annually, of a value of forty thousand francs. It is estimated that not less than three million francs of capital is invested in the marble industry of the province of Namur alone.

But Belgium is rich in quarries of all kinds of building stones, not only marbles, but granite, paving stones, sandstone, slates etc., as will be seen from the annexed tabular statement of the number of quarries and value of their products in the year 1864.*

PRODUCTION OF STONE FOR THE PURPOSES OF CONSTRUCTION IN BELGIUM, IN 1864.

Provinces.	No. of quarries.	No. of workmen.	Value of the products. Francs.
Hainaut	463	10,419	13,445,940
Namur	763	4,020	4,424,897
Liege	280	2,218	1,868,670
Brabant	139	1,893	1,933,200
Luxembourg	106	1,328	1,085,897
Limbourg	13	51	11,875
Totals	1,764	19,959	22,770,479

The marbles of Algeria were well represented at the Exposition, particularly the "marble onyx" from quarries worked formerly by the Romans. It is beautifully veined in parallel layers like onyx, and appears to be of stalagmitic origin. It resembles the stalagmitic marble. Fine specimens of onyx marble were shown also in the Russian section. From Scotland and Cornwall there were several very finely wrought specimens of granite, and from Sweden a fine display of the porphyry of Elfdalen. In the Bavarian section there were two fine vases of a green dioritic porphyry.

The following table shows the weight per cubic metre of some of the various stones employed in the construction of the new Grand Opera House of Paris, and the pressure per square centimetre which each will sustain before crushing.

WEIGHT AND STRENGTH OF SOME OF THE VARIETIES OF STONES USED IN THE CONSTRUCTION OF THE GRAND OPERA HOUSE.

Description of stone and locality.	Weight.	Crushing Weight.
Jasper of Mont Blanc, St. Gervais	2,716	1,839
Brown granitoid porphyry, Bazoches	2,585	1,487
Green porphyry (melaphyre)	2,855	1,111
Red granitoid prophyry, Autun	2,585	1,080
Porphyroidal granite, St. Martyn du Puy	2,567	1,077
Micaceous granite, Lormes	2,694	1,077
Red syenite, Servance	2,654	901
Syenite ("feuille-morte"), Servance	2,683	867
Porphyroidal granite, Servance	2,643	715
Marble ("sanguin"), Sampans, Jura	2,657	1,076
Marble (violace)	2,663	994
Pierre de Damparis, Jura	2,683	898
Pierre de l'Echaillon, Commune de Rivière	2,726	852
White Echaillon, St. Quentin	2,529	781
Yellow Echaillon, Lignet	2,686	777
Rose-colored Echaillon	2,472	606
Pierre de Anstrude, Yonne	2,261	365
Soft stone, Yonne	2,161	369
Pierre de Ravières	2,157	577
Grès bizarré, Lutzelbourg	2,130	215

Cements and Artificial Stones.—Cements were exhibited in great variety from France and Belgium, not only in the crude and commercial state, but worked up into various objects and molded into blocks of a form suited for testing by pressure and weighting.

One of the most interesting displays was made by the French Cement Company of Boulogne-sur-Mer, which received a gold medal. An apparatus for testing the strength of cements was included in their exhibition. Blocks of the hardened cement, about eight inches long, and shaped like a stout letter I, were placed between strong iron clamps, and made to form a link in the chain by which a heavy platform was suspended. Upon this platform below, heavy weights were piled nearly to the limit of the strength of the slender neck of the cement block. One of these blocks, formed of four volumes of sand and one of cement, and one and a-half inch square, sustained a strain of nine hundred kilogrammes. Another one, four inches square, composed of two volumes of sand and one volume of cement, sustained a weight of twelve hundred kilogrammes. The sand used in these experimental blocks was very coarse, nearly as large as beans or peas. Another method of showing the strength of their cement was by building a column of brickwork about six feet long, extending horizontally like an arm, and supported at one end only.

The cement is artificially prepared by mixing intimately and with great care seventy-nine and a half per cent. of carbonate of lime, in powder, with twenty and a-half of clay, and then burning at a high temperature. There are now many establishments in France, Prussia, Germany, Austria, and Russia, where enormous quantities of excellent cement are manufactured. In one of the establishments recently started in France, at Pouilly, the method consists in crushing together two kinds of argillaceous limestone from the Lias; one containing 43.5 per cent. of lime, the other a belemnitic limestone, which contains forty-eight per cent. of lime. The first gives the cement known as the Pouilly, and the intimate mixture of the two gives a cement with the composition of the Portland cement. An analysis of this cement gives the following result:

Lime	62.00
Silica	23.00
Alumina	8.50
Oxide of iron	5.50
Water and carbonic acid	1.00
Sulphate of lime	traces.

M. DELESSE gives the results of some recent analyses of Port-

* Notice sur l'état des travaux puelics en Espagne et sur la législation spéciale qui les régit. Traduit de l'Espagnol, Madrid, 1867.

* From the Catalogue des produits industriels et des œuvres d'art, section Belgique.

land cement by Dr. ZUIBEK, of Berlin, as follows: three samples came from the principal works for the manufacture in England, and the fourth from the establishment of the Brothers MENKOW, at Schwerin:

ANALYSES OF FOUR SAMPLES OF PORTLAND CEMENT.

	Robins.		White Bros.		Knight, Bevans, & Sturge.		Menkow.	
Silica	22.74		22.59		22.31		24.01	
Alumina	7.74		6.43		3.31		5.73	
Oxide of iron	3.70		4.03		9.75		2.39	
Lime	56.68	92.08	57.87	92.56	58.17	95.02	63.77	97.68
Magnesia	0.57		0.55		0.91		0.96	
Potash	0.46		0.74		0.41		0.49	
Soda	0.19		0.35		0.17		0.33	
Sulphate of lime	1.66		2.67		1.17		0.24	
Carbonate of lime	3.50	7.59	0.84	6.51	1.34	5.02	0.67	2.11
Insoluble residue	0.59		0.77		1.06		0.93	
Hygrometric moisture.	1.90		2.23		1.47		0.27	

The Vicat cement is much more used in France now than formerly. It is manufactured on a large scale by Mr. JOSEPH VICAT, a graduate of École Polytechnique, and the son of the celebrated engineer. He forms a paste with clay and slaked lime in powder. This is made into loaves, which soon set and harden so that they are not injured by the weather, and do not require housing or artificial drying, as is the case when unburned materials are used. These loaves are then burned. This is substantially the process invented by his father. M. DELESSE observes of the quality of this cement, that it is homogeneous, the elements being in perfect combination; the clay is changed into silicate, which is completely decomposed without residue in a dilute acid. The setting is slow, and does not commence for several hours after the mixing as mortar. The weight of this cement pulverized, but not compacted by ramming, varies from thirteen to fourteen hundred kilogrammes to the cubic metre. Some interesting applications of this cement were shown. It is used for making artificial breccias by mixing it with fragments of marble of various colors, molding it into the desired form, and then by grinding and polishing the surface a beautiful mosaic is produced. Blocks so made may be sawed into slabs and polished like marble. They are hard and non-absorbent of moisture, and are said to be suitable for exterior decoration.

Among the hydraulic limes, that of Theil, Ardèche, continued to hold its high rank. The limestone beds from which it is obtained are highly fossiliferous, and are over three hundres feet thick. Simple burning is all that is required to produce the cement. An establishment for its manufacture at Lafarge has thirty-four furnaces, and produces three hundred and forty tons of sifted lime daily. The price is fifteen francs per ton, and it weighs seven hundred kilogrammes per cubic metre. It is particularly valuable for marine constructions, and can be wetted with either fresh or salt water. It was used for the formation of the artificial blocks sunk to form the breakwater piers at Port Saïd.

The agglomerated béton of Mr. COIGNET was most fully represented at the Exposition, and was used in the construction of the reservoirs and for the foundations of the outer gallery. For a full description of this material, its preparation and uses, reference is made to the special report by Mr. LEONARD F. BECKWITH. Reference may also be made to the publication by Mr. COIGNET * and by Mr. CLAUDEL.†

Oxychloride of Magnesium Cement.—By mixing magnesia with oxychloride of magnesium, a cement is formed analagous to that made with zinc oxide and the oxychloride of zinc. Both of these cements are the invention of Mr. SOREL. The hardness of the cement varies with the density of the chloride solution. An increased hardness is given by saturating the chloride of magnesium with chloride of barium or with sulphate of magnesia. The addition of one part of quicklime, or two parts of carbonate of magnesia, in one hundred of the chloride at 25° Baume, augments the hydraulic properties.

Ferruginous Cement.—M. ALFRED CHENOT proposes to form a ferruginous cement by mixing iron in a state of extreme subdivision with sand. A cememt so formed has long been known and used to a certain extent in the United States. M. CHENOT proposes to manufacture the iron in a state of sponge and upon a large scale, by reducing iron ore, mixed with carbon, in a close furnace.

Ransome Artificial Stone.—This remarkable compound is adapted not only to interior, but to exterior construction, and rivals the natural sandstones in hardness and durability. It is formed by mixing sand with soluble silicate of soda, and, when molded into the desired form, treating the mass with a solution of chloride of calcium. A double decomposition takes place, hydro-silicate of lime is formed, and binds the grains of sand strongly together. For a full description of this artificial stone and its applications, reference is made to the report by Commissioner BARNARD upon the Industrial Arts.

Zinc for Construction.—Zinc in its various forms of sheets, wire, nails, and stamped ornaments appears to be much more used in construction in Europe than in the United States. The display by the Vieille-Montagne Company, and the Silesian Zinc Company of Breslau was very extensive. Some of the advantages claimed for this material over other materials for roofing are its lightness, tenacity, and cheapness compared with lead, slates, or tiles. The Vieille-Montagne Company claim that the inclination of zinc roofs need not exceed 0m.1 per metre, while slate requires 0m.3, and tile 0m.45. For a building 12m.50 long by 6m.80, covered with No. 14 zinc, at 80 francs the 100 kilogrammes, the cost would be:

	Francs.
With zinc, 1,075.09 francs, or per square metre	13.45
With slates, 1,245.97 francs, or per square metre	15.69
With tiles, 1,745.96 francs, or per square metre	21.80

For a shed 63m.00 long, 18m.00 wide, with an iron frame, and covered with No. 14 corrugated zinc, at 80 francs per 100 kilogrammes, the cost would be:

With zinc, 18,749 francs, or per square metre	16.50
With tiles, 22,767 francs, or per square metre	20.10

For temporary constructions they advertise sheets Nos. 10 and 11, which weigh 3k.45 to 4k.15 per square metre. It does not require painting, and the old sheets may be sold for thirty-five to forty per cent. of the cost of new.

The Silesian Zinc Company manufacture zinc sheets of all sizes and thicknesses, from two ounces per square foot upward. The large plate exhibited is seventeen feet long by fifty-four inches wide, and three-quarters of an inch thick. It could have been made twice as long as this, and with a total weight of forty-two hundred pounds, if room could have been procured for its installation. The corrugated sheets of large curve, when laid lengthwise, are made nine feet long and up to forty-one inches in breadth. These sheets are used chiefly for roofing large railway stations or other large buildings. The new exchange at Berlin is covered with zinc from this establishment.

* Emploi des bétons agglomérés, etc., par François Coignet, Paris, 1864.
† Pratique de l'art de construire, Paris. 1863.

British Columbia.

From an Essay by R. C. L. BROWN, M. A. (1864.)

PHYSICAL GEOGRAPHY AND METEOROLOGY.

THE Rocky Mountains, which may be termed the spine of North America, run from northwest to southeast, forming the eastern boundary of British Columbia. They are part of the mighty chain which, as the Andes, transects South America, and which crossing over into Asia at Behring's Straits, may be followed as far as Arabia, and again traced in Africa; while a branch appears in Europe as the great Ural range. The range, which is composed mainly of igneous rocks, is found to contain auriferous strata at various points of its world-encircling course.

From a spur of the Rocky Mountains, rise the Fraser River, flowing first towards the north, and the Columbia, flowing south, their sources being only a few yards apart. It is probable that the mountains of which Cariboo forms a part, run nearly parallel to the Rocky Mountains, at a distance of one hundred to one hundred and fifty miles, but of these little is known.

The great Cascade range runs almost parallel to the Rocky Mountains, at a distance of from two hundred and fifty to three hundred miles. It has ramifications in all directions, and from various points sends down rugged mountain spurs, which meeting the sea, form deep inlets. The Cascade Mountains are composed chiefly of igneous and metamophic rocks with dykes of trap. In some places crystalline limestone appears in contact with other rocks. There are mountains of this crystalline limestone two thousand feet in height, as in that magnificent gorge called the Marble Cañon, thirty miles northeast of Lillooet. No trace of fossils occurs in these rocks, which evidently belong to the igneous series. Huge granite boulders are found along the Fraser, but granite is not so abundant as limestone. Between Similkameen and Lake Okanagan, one sees scattered everywhere small rounded masses of vesicular lava, having the appearance of vitrified sponges.

The district of the lower Fraser, from Harrison River to the mouth, and from Burrard Inlet south, was probably once an estuary. The geological feature of this section of country is loose friable sandstone and alluvium; this sandstone occurs in alternate layers with lignite; at Burrard Inlet it is found to contain fossils of leaves and branches of trees. Sandstone is found also cropping out on the Brunette, near New Westminster, such as would be excellent for building purposes.

To the north of Burrard Inlet, the coast is, says Dr. FORBES, "a rugged mass of plutonic trappean and quartzose rocks, with associated semi-crystalline limestone," much the same, in fact, as the Cascade range.

The coast is deeply indented with numerous inlets and arms of the sea, many of which afford excellent anchorage. "The Colony of British Columbia," says Dr. FORBES, "has a noble barrier for the protection of its shores. An outlying ridge, another parallel chain of mountains, cut off however by the sea from the continent, with which in its physical geography it is connected, forms an archipelago of islands, the chief of which is the sister Colony of Vancouver." He further adds, with reference to the country round the mouth of the Fraser, that but for the protection given by Vancouver Island against the storms and currents on these coasts, "the loose friable materials of that district must have been long since swept away, and what will eventually be a rich agricultural country lost to the industry of man."

As already observed, the districts on the east and on the west of the Cascade range are vastly different. The great "divide" between these two districts is passed on the several routes, near the Half-way House, on the way to Lillooet, and at Boston Bar, on the Yale route. The country on the west of this is thickly wooded, the soil is moist and loamy, vegetation is luxuriant. Beyond the Cascade range, on the other hand, the timber is, generally speaking, poor; the soil is lighter, but the herbage is excellent. Nor is the difference in climate less remarkable west of the Cascade Mountains; the climate, tempered by the ocean, is more equable and mild; the winters are less rigorous than on the eastern side, the summer sun less powerful. In the northern parts again we find the features of the landscape changed. The country from Williams Lake to Cariboo seems to resume the aspect of the lower Fraser. Trees abound and grass is more rare. Much rain falls.

It is not easy to give satisfactory information on the very important subject of climate. The recent origin of the colony, and the want of proper instruments for observation at different points over the country, render our knowledge exceedingly limited. Indeed, there is only one district concerning which we possess any definite information whatever, namely, the southern corner east of the Cascade range; for this we have the observations taken at the observatory at New Westminster by the Royal Engineers. It were greatly to be desired that government would cause observations to be taken at all the principal towns.

Generally speaking, it is a notorious fact that to the west of the Rocky Mountains, the climate is much more moderate than on the eastern side. No Arctic currents wash these coasts similar to those which render the winters of the countries of the Atlantic so intense. January and February are usually cold months, March and April variable—the plains begin to be clothed with verdure. May to October, and sometimes November, fine, clear, warm weather; in the last two months the evenings are frosty. December is cold and wintry. In summer, on the other hand, the mercury shows 100° in the shade. In this section of country little rain falls. More rain fell in 1862 than in 1861, more again in 1861 than in 1860.

In the Okanagan district there is a great supply of rain; at Williams Lake a sufficient quantity. At the latter place the winters are more severe than at Lillooet, the thermometer sometimes ranging as low as 40° below zero; yet the weather is clear, and without wind; and in the experience of those accustomed to cold climates, any cold is bearable, and even enjoyable, so long as the sun comes out during the day and the winds are still.

At Alexandria and Quesnel mouth, snow appears in the end of November, and lies to a depth of eighteen inches for three or four months; January is the coldest, August the hottest, June the rainest, August, September and October the driest months in the year.

The climate of Cariboo is severe. There the winters are long, lasting from November till the end of April; yet the weather is usually clear and calm; snow falls principally in January or February, sometimes to a depth of from seven to ten feet, so that snow shoes are used for winter travelling.

But with the exception of Cariboo, the climate of British Columbia is universally regarded as one of the finest in the world. Nor can the fact of its extreme healthiness be too much insisted on. Cases of sickness are rare, and many who suffered at home from feeble health, have here inhaled new life from the bracing mountain breeze.

MINERAL RESOURCES.

British Columbia is pre-eminently a gold country. To its gold it owes its existence as a colony. Only that mighty magnet, which attracts man with so potent a spell, because it represents to him all that earth can bestow, could have drawn a population into regions so inhospitable and so remote. But for these gold discoveries, it is more than probable that the unclaimed acres of other more attractive lands would have been occupied by the settler, ere enterprise and endurance forced a path through these forests, or laid bare the treasures of these mountains.

The "colour" of gold has been found in parts of the country the most dissimilar in appearance, and the most remote from each other. By the "colour" being found, is meant that when all the earth has been "washed" or removed by water out of the pan or basin used for the purpose, some specks of the heavy metal are found to remain behind. The "colour" then has been found on the bars and banks of the Fraser River and its tributaries, and in the benches which run parallel to the Fraser. The country is almost surrounded by auriferous mountains, gold being found on the Stickeen and Peace Rivers to the north, in the mountains which transect the eastern, as well as in streams flowing through the western portions of the country.

The gold found on Fraser River and its benches is remarkably fine, and cannot be obtained without the use of quicksilver; when thus procured, it is subjected to the action of heat to remove the quicksilver; some of the latter, however, still remains in it, and this kind of gold, from its admixture with the quicksilver, is called *amalgam dust*.

Along the whole course, from Hope to beyond Alexandria, there are certain remarkable gold-containing benches. These benches are well described in a letter in the *Times* from its "own correspondent" in British Columbia. He says: "The Fraser, and many of its tributaries, are skirted or bordered by terraces, all of which yield gold. These terraces, or benches, as the miners call them, run at intervals along both sides of the rivers for miles in length; and they recede where the mountains retire, for distances back into the valleys varying from a few acres to a few miles in breadth. They are objects of curiosity and speculation, and add much to the beauty of the rude scenes in which they occur, from the regularity and evenness of their structure. They generally occur on both sides of the river, and in some places are multiplied into several successive level plateaux, rising one above the other as they recede from the bank."

The claims on the river have been mostly abandoned by white men, the attractions of Cariboo proving more inviting. These claims are now worked by Chinamen, whose wages average two to five dollars a day.

The further one goes up the Fraser and its tributaries, the coarser the gold becomes. The first pioneers of the country expected to find it so. Where, they asked themselves, as they examined the fine gold of the lower Fraser, does this dust come from? It must be formed by the disintegration of coarser gold—where then is the coarser gold, and the quartz veins whence coarse gold comes? So those enterprising men went up the river and its tributaries in quest of coarse gold. This was discovered in 1859, first on the Quesnel River, and late in 1860 followed by the discovery of Cariboo.

Cariboo is unquestionably the richest part of the county yet explored. In that region the gold is found both is the beds of the creeks and in their banks. The bed-rock from which it is taken is very irregular, being "struck" sometimes near the surface, sometimes at a depth of from twelve to fifty feet. The bed-rock itself consists of slate, which is generally of a blueish color, though sometimes of a yellowish-white, for the primary

or igneous rocks which form the marked geological feature of the whole country are, in Cariboo, of a schistose or slaty character. The gold is found in the blueish clay which is on and in the slaty bottom, sometimes as far as a foot deep; streaks of yellowish clay are also found, which are sometimes very rich. The gold appears to have been held in the ridges of the slate, (which lie generally at an angle of 45°) as in a natural riffle. No quicksilver is used, so that the tiny particles are allowed to escape. But these "tailings" will all be washed over again with quicksilver at some future period.

The gold of Cariboo is frequently found mixed with quartz. Sometimes the quartz is in the centre of the specimen protected by the gold; sometimes the specimen shows only the slightest admixture of quartz, or again it is almost all quartz with a bright spot of gold, offering a fine contrast with the white stone. It is interesting to note the history of this combination. In order to understand it, we must go back to the fountain-head, namely, the rocks from which this gold, with its quartz, has come. Here is an igneous metamorphic slate-rock, one of those giants primeval, who bear the world on their shoulders; it is in a state of intense heat; it cools, and in cooling, cracks; through its cracks or fissures water passes containing silica. It deposits its silica in the rent of the fire-rock, probably on both sides of the rent; and so the sides of the rent or fissure are coated with quartz. Up from beneath rushes a stream of molten gold; the fluid metal mixes and combines with the quartz, and remains in union with it when it cools and hardens.* In progress of time the rock which holds this gold and quartz is worn away.

The gold pieces have been scattered and subjected to various influences. Where they have been driven to a distance or subjected to the action of water, sand, etc., they become rounded, like many of the Cariboo specimens (e. g. Williams Creek); sometimes the pieces are more jagged and angular, as if they had not been driven far, but left where they fell, the quartz which encased them having decayed and fallen away from about them. Such is the Lowhee gold.

In the early part of the season of 1861, the most important creek in Cariboo was Antler. This creek yielded at one time, at the lowest, $10,000 a day. The writer was present when on one claim $1,000 were taken out of the sluice-boxes, as the result of a day's work. Later in the season, Williams Creek came into notice, and ere long wholly eclipsed Antler. One claim, STEELE'S, gave one day 387 ounces, and even reached a maximum yield of 409 ounces; the total obtained on that claim, on an area of eighty feet by twenty-five, was a sum of £21,000. The experience of 1862 has confirmed the opinion of the great wealth of Williams Creek, and shown it to be one of the richest creeks in the world. In 1861 gold was found on that creek only in six claims, but now the valley is taken up for six miles, both in the creek and in the hillside. In 1861 the only mining was in surface diggings. The mining of 1862 assumed a new character, and shaft-sinking, drifting and tunnelling are now vigorously prosecuted—a system of mining, be it observed, which, unlike the former, can be carried on throughout the entire year.

In the summer of 1862, the highest amount taken out by any company in twenty-four hours, was $9,050 (£1,810); this was in CUNNINGHAM'S claim. The same claim averaged nearly $2,000 a day during the whole season. There were four full shares, having six hundred feet frontage, the claims being discovery claims, and consequently larger than others. On several days 52 pounds were taken out. The Bishop of Columbia witnessed 600 ounces taken out in one day on a claim. ADAMS' claim yielded to each of its three partners, $40,000 (£8,000) clear of expenses. In BARKER'S claim, eight partners realized £1,400 each. It is believed that on this creek, last year, one hundred and fifty five claims paid expenses, which would average $2,000 each, making a total of $310,000, and about an equal amount was cleared. The entire yield of the creek for the season may accordingly be estimated at $620,000. The gold of this creek gives in fineness .830.

Yet the results of the season of 1862, brilliant as they were, were in the main disappointing, for only a few, a very few, gained any large harvest of gold; a dozen claims, it is said, paid beyond expectation; half a dozen paid enormously. The season, it must be remembered, was very severe and very late. It was not till late in August that shafts were sunk; previously provisions were so dear and scarce that nothing could be done. After the summer season, mining operations were carried on in a few claims during the winter. A new part of the creek, "below the cañon," hitherto unprospected, was found to pay as richly as the famous claims above the cañon, and $300,000 were taken out of three claims, between October and January, 1863, in attestation of which 150 pounds of gold were brought to Lillooet on the 21st of February. Later in the spring of 1863, DILLON'S claim gave the extraordinary yield of 102 pounds in one day, or about £4,000 sterling. There is thus every ground for the anticipation (a general one) that the present year will far surpass the last, and yield ten times the amount. Many claims are now in working order, shafts sunk, everything ready, and the season promises to be an early one.

A word on the other creeks. Lowhee Creek has paid very well; a great many claims are taken up, and much is expected from this creek. The quality of the gold on this creek is .920. Lightning Creek (the color is found all over it,) has not, however, yielded much this year. It is difficult to work, the soil being loose and gravelly. The bed-rock is found from eight to thirty feet below the surface. The prospects for next year are excellent. One claim, (Campbell's), which it cost $25,000 to open, paid over $100,000 in three months. Antler Creek is said to have disappointed many last year, as only some half-dozen claims paid, yet, in the opinion of miners, this creek is by no means exhausted, and it is confidently expected that a good deal will be done on it in the ensuing year. Generally speaking, the maximum fineness of British Columbian gold is 940, or $19.43.15 per ounce; the minimum, $17.15.76. In the colony, however, Cariboo gold can be bought for $16 or $16 50; a lucrative trade could thus be done in exporting gold dust. Nuggets of pure gold have been found weighing five ounces, and, with an admixture of quartz weighing sixteen ounces (Lowhee).

The diggings hitherto described are more or less of a transient character. True, on Williams Creek the mining is generally expected to last for ten years at least. But more permanent diggings are essential to the establishment of the colony on a lasting basis; and such diggings have at last been discovered in the quartz leads, of which intelligence was received late in the autumn of 1862. One of these, which is situated within ten miles of Keithley's Creek, is reported very rich. The vein, which is eighteen inches thick, is said to contain ten dollars worth of gold to the pound of quartz. In the vein there is also some galena, and a large per centage of silver. These mines will probably be worked this spring, and thus will be introduced a more elaborate and more desirable system of mining than the present. In California, where most of the surface diggings are exhausted, quartz mines are still extensively worked. Everything seems to indicate that the Cariboo Mountains are a continuation of the California range, and will prove equally rich and equally lasting.

Cariboo, imperfectly as it is known—for last year but little prospecting was done—is thus seen to be one of the richest gold fields in the world. Notwithstanding, it cannot be denied that it labors, and has labored, under great disadvantages. Chief among these is the dearness of provisions. Flour, beans, and bacon, the main articles of food at the mines, have seldom been sold for less than one dollar per pound, generally more; in January, 1863, flour was ninety cents (3s, 9d.) per pound at Richfield. (Only beef has been cheap at 1s. to 2s. per pound). No doubt mines must be rich when men can afford to pay so highly for the necessaries of life. But although this dearness of provisions is no hardship for the rich claim-owner, it falls heavily upon the miner on his first arrival in that rugged country, seeing that he has yet to find and open a claim, and is, perchance, provided with only a scanty purse. Worse than all, there was a time last summer when, owing to a "great rush" of people to the mines, there was an absolute dearth of bread. It is probable that provisions will continue high during part of the present season.

The causes of this state of things have chiefly been the great distance of Cariboo, and the want of roads, which rendered it necessary for everything to be packed on mules into the mining district. These causes are, however, being removed, as wagon-roads are in course of construction into the very heart of the mines. Another cause of the dearness of provisions is assuredly to be found in the fact that all the carrying trade has hitherto been in the hands of a few men, of narrow means, and many of still narrower spirit. There is no reason in the nature of things why flour should not be sold at Williams Creek at 1s. 6d. to 2s. per pound. But this will scarcely be the case until the trade of the country is in better hands. If, however, a great forwarding company were organized, to convey goods through from Victoria via New Westminster and Lillooet, or by any other way which is found practicable, the present unfortunate state of things would come to an end, and provisions in the mines brought within the reach of all. It is indeed scarcely likely that any such great and beneficial scheme will be attempted until a new set of enterprising English capitalists come into the country. Hitherto, there has been but little capital; what little is in Victoria appears to be frittered away in trifling land investments, rather than expended in opening up the vast resources of these mines.

Other disadvantages which Cariboo labors under, are the shortness of the mining season and the inclemency of the weather. The shortness of the season in which prospecting can be undertaken, or surface diggings worked, (from June to October), is indeed a disadvantage to the individual miner that will probably prove ultimately beneficial to miners in general, and the country at large. Surface, or placer diggings, which could be worked all the year, would be soon exhausted; this happened in those parts of the California mines where the climate was temperate. In Cariboo, on the other hand, the surface diggings will hold out for many years; and not merely give, as in California, splendid fortunes to the few, but a competency to thousands. Meanwhile, time will be given for the country to be settled. But the operations of drifting and tunneling, now entered upon, are such as can be carried on through the whole year; and will be, no doubt, so soon as a supply of provisions sufficient for the maintenance of a large number of men can be carted into the mines in summer or taken in on sleds during winter.

The climate of Cariboo is irregular and ungenial in the extreme. The summer season is more accurately defined as the rainy season, and not unfrequently does a storm of snow and sleet mar the sunshine of an August day. In the matter of climate, Van Winkle is, however, superior to Richfield. Usually, September and October are fine throughout the whole of Cariboo. Yet, even where the weather is least propitious, British Columbia proves as salubrious as in those districts where she is blest with sunnier skies; sustained by the buoyant mountain air, the miner goes unscathed through countless hardships, brings a keen appetite to his beans and bacon, and rarely indeed suffers from rheumatism, although often compelled to lie down in wet clothes from Sunday to Saturday. Again, with all its drawbacks, Cariboo enjoys the advantage of having abundance of wood for mining purposes, and numerous streams of water. The miners of Australia were often hindered from want of water, and in 1862 many came to British Columbia from New Zealand, because there they could not mine from want of wood. It thus seems that every gold field must have some disadvantages; but amongst those of Cariboo, want of these necessaries cannot be reckoned.

It were vain to attempt any computation as to the extent and duration of the mines of Cariboo. As already remarked, its mountains appear to belong to an auriferous range, extending both to the north and south of Cariboo. That the latter form part of a great gold region, is clear from the fact that several auriferous rivers take their rise in that section of country. About one hundred and fifty miles from Cariboo rise the Fraser and the Columbia, both gold-bearing streams. Not very far distant are the head-waters of Peace River, flowing northwest through the Rocky Mountains. On this river gold was found last summer some two hundred miles from its source. The gold is described as fine in quality, like that of Frazer River. The explorers found good diggings—four men taking out in eight days, $3,300—but its provisions being exhausted, they had to leave. It is confidently expected that a number of miners will be at work there next season.

The Stickeen River also, on whose banks fine gold was discovered last summer, and to which so great a "rush" of people repaired that it was deemed necessary to create there a new British colony—the territory lying beyond the northern boundary line of British Columbia;—takes its rise in the same mountains. Everything, in short, seems to indicate the existence of wealthy mines in and beyond the district of Cariboo, to the north.

The North River flows into the Thompson at Kamloops, perhaps two hundred miles from Cariboo, southeast, as the crow flies. This river takes its rise in the neighborhood of the Cariboo Mountains. It has been but slightly explored, but is believed to be auriferous, and would doubtless repay the labor of prospecting. It is navigable for nearly sixty miles north of Fort Kamloops, where it joins Kamloops Lake; and it is not impossible that one of the great roads to Cariboo may be via Fort Kamloops and the North River. The Tranquille River flows into Lake Kamloops out of the north, some five miles west of the fort. A considerable quantity of gold has been taken out of this little river. The writer found a crowd of Chinamen working there in June, 1861; their wages averaged seven dollars and fifteen cents a day. Looking southeast, towards Okanagan, we find the streams everywhere auriferous. And beyond, from Okanagan, at Similkameen, southwest of the lake, and to Rock Creek on the frontier, to the southeast, we find traces of gold. Eight streams, which flow into the lake and the two small lakes adjoining, give the "color." Indeed, in 1860, this country was the rage among miners, and though now abandoned for Cariboo, its wealth is very far from exhausted. In July, 1860, as many as two hundred white men were at work in these localities, and many claims paid from twenty-five dollars to one hundred dollars (£5 to £20) a day.

Nor is the gold field confined to the eastern section of the country; from Peace River to the border, even to the west of the Fraser, gold has been found; the quantity hitherto obtained on Bridge River, Lillooet, Last Chance, (streams entering the Fraser River on its right bank), has been small, but its gold has been partially coarse, one piece found on Bridge River weighing an ounce and a half.

Of the other mineral resources of British Columbia, little is known. The country is believed to be very rich in many minerals. Indications have been found of silver, copper, tin, platinium, plumbago, galena, (lead), iron, limestone, coal, etc. To the silver mine at Hope allusion has already been made. Indications of rich silver leads have been found in various parts of Cariboo. Pieces of copper ore have been found at several places. Galena has been obtained at Williams Lake and elsewhere. Plumbago near the northern coast, etc. Indications of iron and limestone are visible at many places. Outcroppings of Lignite or Tertiary coal are found at Alexandria, the Similkameen, and Burrard Inlet. At the last-named place a small shaft has been sunk for trial, but the mines have never been worked. When the country becomes thoroughly explored and prospected, the number and value of its minerals will be found to exceed all anticipations.

[The foregoing account, though somewhat old, is worthy of perusal, as containing much information of permanent value.—ED.]

* This theory will not hold good at the present time.—ED.

MINING SUMMARY.

Colorado.

UNPROFITABLE MINING.

We have often taken occasion to deplore the fearful waste of time and money incident to the system now in vogue in many of our most promising mining districts, of working the richest lodes by several different corporations. We are glad to see the Colorado press giving attention to this subject, and reproduce the following article from the Colorado *Herald*, showing how the present division of labor system is viewed in that locality: "The early custom among prospectors of dividing claims, and restricting them to one hundred feet, has entailed an evil of great magnitude upon mining in Gilpin county. Of course in those days such a division was deemed equitable, and under the circumstances no other course would have been satisfactory. This, however, does not lessen the evils which the custom entailed upon mining. When property was sought for by purchasers it was found impossible, for many reasons, to make consolidation of individual claims where it ought to have been done. In this way a great number of claims adjoining on the same lead have fallen into the ownership of different companies and individuals, none of whom oftentimes hold more than one hundred contiguous feet. On the best leads this evil has been the most serious. Upon such the largest expenditures have been made, and consequently affording a larger margin for extravagance. It would not take much time to prove that on the Bobtail, for instance, more than half a million dollars has been actually expended by the multiplication of shafts, shaft-houses, engines and machinery, pumping and in many other ways, four-fifths of which could have been saved to the interest of owners, had the claims upon which this work was done been in one ownership and under one management. The same may be said in regard to the Gregory, in which, most likely, larger amounts have been

uselessly expended under the compulsory condition of ownership. The Bates affords another example; so the Gunnel and many other leads. It would not be extravagant to estimate this increase of expenditure, over what should have been necessary for development, at from one and a half to two millions of dollars. Now, while a large portion of this expenditure was paid for labor and material here, yet a very large portion of it had to be paid for materials furnished from a distance, and all finally was charged against production, doubling all the expenses of mining—if, for instance, two parties owned and developed two adjoining claims, and trebling it, if three contiguous claims were thus operated. A continuous vein of one thousand feet would require but two shafts with appurtenances, and might be worked with but one engine. While under ten ownerships, possibly ten engines, with all the essentials of attendance, would be required. Very nearly as much ore could be raised through the two as would likely be raised through the ten. The expenses per ton of the latter would exceed that of the former at least two-thirds. The mining simply might be equal, but when the cost of sinking and maintaining ten shafts instead of two, and running ten engines instead of one, is considered, the enormous increase may be readily appreciated.

One of the most striking examples of this kind of mining, is to be found in the case of the famous Comstock silver lode in Nevada. It is estimated that the bullion obtained from this vein has reached nearly, if not quite, $100,000,000, whilst the expenditures were very little inferior, affording scarcely any profit to the owners. In the language of another, which we now quote: "The reason is simple. Unnecessary labor has been employed, and vast sums of money wasted in extravagant speculations and litigations, and the root of the whole evil lies in the system of scattered, jealous, individual activity, which has destroyed, by dividing, the resources of the most magnificent ore deposit in the world. Thirty-five or forty companies, each owning from 10 to 1,400 feet along the vein, and each, almost without exception, working its own ground independently; 40 superintendents, 40 presidents, 40 secretaries, 40 boards of directors, all to be supplied with salaries, or, worse yet, with perquisites, or, worst of all, with opportunities to speculate; an army of lawyers and witnesses, peripatetic experts, competing assayers, thousands of miners uniting to keep up the rate of wages; these things explain the heavy expense of Comstock mining. Aside from this immense drain of money, amounting to 20 per cent. of the whole production, the labor actually performed has been, for the want of united action, often useless. There have been tunnels enough run by different companies, into the Comstock lode to make, put together, the whole length of the Sutro tunnel. Hardly one of them is good for anything to-day. The Bullion company, which has the deepest shaft on the lode, never had any ore, but has spent more than a million of dollars in prospecting, while some neighboring, like the little Kentuck, have be in *bonanza* for long periods. Now this division of a vein which gives the rich chimney to one owner, and the barren intervals to another is not conducive to economy. The result has proved to be that both owners waste money."

No remedy can be offered now which could cover all the cases of this kind in Gilpin county. But its exposure to reflecting minds cannot result in any evil, whilst it may cause more circumspection in future expenditures. The magnitude of the evil can scarcely be over estimated in its effects upon this as a mining region. It is shown, as it can be of the Comstock lode alone, that we can raise and ship ten millions of bullion a year at a cost of nearly that amount, we have made but little progress in obtaining the favorable consideration of capitalists. With regard to mining no subject is of more importance, and we are pleased to know that one of our most practical and intelligent superintendents has succeeded, in part, in effecting a consolidation on one of the chief lodes in the Gregory district. Perhaps the wise management thus inaugurated may be followed by others, and thus relieve us, in a measure, from an evil which is almost beyond computation in money.

Oregon.

MINERAL RESOURCES.

Upon the request of the Immigration and Labor Exchange of Oregon, Dr. John A. Veatch, of Portland, a mineralogist and chemist, has recently given to the public an outline of the mineral resources of that State. He says: "Oregon abounds in mineral wealth through its entire extent, no less than California. The Coast Range, a continuation of that in California, is largely metalliferous. A heavy deposit of cinnabar is found on the eastern slope, and the western slope is auriferous. The sands of the ocean near this range are charged with gold, platinum, iridium, and iridosium in almost inexhaustible quantities, extending back many miles inland. Lead has been found on both slopes. The finest coal on the the Pacific shores is found at several points between this range and the ocean. That of Coos bay is well known in San Francisco, bearing, I believe, the best price of any of that character of coals. Iron ore, limestone, and manganese are also found. The cascade range, forming the eastern boundary of the great Willamette Valley, is a prolongation of the Sierra Nevada, and like it carries no stint of metallic wealth. In the southern part of the State it has furnished extraordinary deposits of gold in isolated spots, seemingly disconnected with any regular veins. Many of those irregular developments, or "pockets," have yielded large sums of gold, occurring in masses permeating quartz, but so dense as to hold the quartz together. These isolated deposits located within the cleavages—not veins—of the rocks, prove the metal-bearing quality of the formation. A regular vein found in such a locality could hardly fail to be rich in the prevailing metal. Notwithstanding the absence of any systematic search, many regular veins have been brought to light, and feeble attempts made at working them—a few small mills have been erected; but from want of capital, and perhaps of skill, no brilliant results have been achieved. There is, however, but little doubt of the great richness of many of these veins now temporarily abandoned. The Bohemia mines, situated in the Umpqua mountains, a cross range which connects the Cascade and Coast ranges, is a large group of very large veins. I was told of other vein-groups in the same range.

"Near Canonville is a district extensively permeated with gold-bearing veins. Valuable copper ore has been found in the same vicinity. Immense quantities of gold-bearing iron pyrites are found not far from Roseburg. They yield from $20 to $35 per ton, and are destined ultimately to be a source of boundless wealth. At Oakland, a few miles north of Roseburg, a heavy quarry of limestone occurs. All the above are very near the route of the Oregon Central railroad. A little further north, not far from Eugene City, another extensive group of gold producing veins occurs, with evidence of richness. This locality is favored with unlimited water power, most favorably situated as regards the larger veins of the group. Good roads exist to within a short distance. These exceedingly favorable conditions, backed by an abundance of good lumber, render this locality very attractive. The Santiam mines are extensive, and probably rich. Unfortunately, a few ich 'pockets' first discovered, and the usual result followed. Expensive tunnels were excavated, to strike imaginary lodes, and every cleavage fissure of the bed-rock was magnified into a 'well-defined vein.' Lead and zinc abound in the neighborhood, probably the most extensive developments of the kind on the Pacific coast. The iron ores of great purity found on the immediate banks of the Willamette, as well as at various other points in the great valley, amid the grand Oregon forests, form one of the most striking features of the mineral wealth of the State. These great iron beds are practically inexhaustible in quantity. Coal is found in considerable quantities in various places in the valley. Limestone abounds a few miles from Oregon City. Fire clay, potter's clay, and other economic minerals have been brought to light. Good marble of rare beauty is found in Jackson county. Mineral springs abound, rich in salt and borate of soda (borax), usually accompanied with iodine. Carbonated water, rich in all the ingredients sought for in medicinal springs, are not unusual. One of these, the Wilhoit springs, I have found to approach Saratoga Congress water very nearly in composition. The great fountain of metallic wealth is, however, to be found east of the Cascades. Many entire mountains are composed of a perfect network of metalliferous veins. In point of numbers they are not excelled by an equal area, perhaps, in any other portion of the world. A very large proportion of these seem to be rich, from tests made mostly from the surface. The chief metal is gold, but silver, lead, copper, zinc, antimony and mercury are all abundant. The contemplated Northern railroad is destined to awaken this slumbering interest, as the Oregon Central road is quickening into vitality that of the Cascade and Coast ranges."

Nevada.

REVIEW OF THE COMSTOCK MINES.

The Gold Hill (Nevada) *News*, Feb. 8, has the following: "The most sensational circumstance occurring in the mining stock line during the past two weeks has been the sudden jump of the Gould & Curry, from about $50 or $60 per share to $185. This was partly speculative, and partly based upon new and extra good ore developments, and it is on the decline again at present. Stocks generally continue rather depressed, with no present prospect of a lively revival.

"GOULD & CURRY.—The cause of the recent very sudden and precipitous rise in the stock of this company was the development of a very good body of ore above the second station, in drifting from the old North Potosi shaft, and which still looks exceedingly promising. How long it will hold out remains to be seen, as it is not yet fairly opened for advantageous working. Some encouraging features are also met with in other portions of the old upper workings of the mine, and the El Dorado tunnel will in a day or two be in proper condition for the extraction of ore through it. The present daily ore yield of the mine is about forty tons, average assays being $46. Prospecting at the lowest or seventh level is energetically conducted, with no new and encouraging indications as yet.

"YELLOW JACKET.—The sinking of the south shaft to the 1,020-foot level will be completed to-morrow, and a station will next be opened to drift east 150 feet to the new body of good ore discovered at that point by a drift from the 1,000-foot level of the Crown Point. This new body of ore promises well, widening out as drifted upon northward. Its depth or height is not yet ascertained, but it breasts out nine feet in width, yielding already about thirty tons of $30 ore per day. The finding of such a good body of ore at that depth and locality is a very encouraging circumstance in the future prospects of the Crown Point, Kentuck and other mines contiguous. The main Yellow Jacket mine is yielding about the same as at our last report.

"HALE & NORCROSS.—The ore breasts throughout the sixth or lower level continue looking exceedingly well. This level is being continued to the northern boundary, showing very good ore as yet. At the 535-foot level the drift east has penetrated the main pay streak, which is found at that point to be twenty feet wide. The present daily yield is about 145 tons, principally from the sixth or 1,100-foot level. The old upper portion of the mine shows an improved yield, some thirty tons per day being extracted from the 175-foot level. The sinking of the shaft deeper is being energetically prosecuted, and the point for opening the seventh level will be reached very shortly.

"SACRAMENTO AND MEREDITH.—Grading for the new mill of the company was commenced last Thursday. The site selected is just below the Gelger grade, in the immediate vicinity of the mine, where there is a plentiful supply of water in a deep shaft belonging to the company. The ore from the mine can be dumped through a shute down to the mill with great facility, or to a tunnel can be driven directly from the mill into the mine, if required. An abundance of excellent surface ore is now being accumulated on the dump for working when the mill is completed, which will be in about two months.

"CROWN POINT.—This has, within the last three or four weeks, become a producing mine once more, giving now a daily yield of about seventy-five tons of fair grade surface ore, taken from the 160 and 230-foot levels. This is shipped to the Rock Point mill, Dayton, for reduction. Nothing good developed in prospecting at the lower levels. The winze between the 1,000 and 1,100 foot levels is completed. An incline will be commenced shortly from the bottom of the shaft, next to the west wall, sinking for a new or 1,200-foot level.

"BELCHER.—Good progress is being made drifting at the 730-foot level; the quartz encountered looks very encouraging. The 152-foot level gives a good regular yield of fair grade ore, which can be extracted with much greater facility and cheapness when the drift is finished through which it is to be run out in cars directly to the Rhode Island mill. The trestle bridge across Gold Cañyon, for that purpose, is already completed. The present yield of the mine is forty or fifty tons per day, which is sent to the Rhode Island mill for reduction.

"CHOLLAR-POTOSI.—Present daily yield 175 tons; average assays, about $47 per ton. The mine shows a better yield and appearance within the last week or so. The Grass Valley section especially looks highly encouraging, some very good ore being recently found by a drift at that point. The drift west from the new shaft, at the 450-foot level, is now in over 260 feet, and being energetically driven ahead.

"OCCIDENTAL.—The old mine continues yielding well, and the lower tunnel is being driven ahead energetically. Cross-cutting will shortly be commenced from it to the great pay ore chimney, and the connection with the winze from the adit level of the old mine will be made.

"IMPERIAL-EMPIRE.—The new engine will be ready to run in about a week, when either drifting or sinking will be commenced or resumed at the bottom of the shaft, which is now 1,194 feet deep.

"SIERRA-NEVADA.—A very good and promising streak of ore developed a day or two since in the west portion of the car-track level, causes quite an elevation in the stock at present. Both mill and mine are working steadily and well.

"OPHIR.—The water in the new shaft is reduced to below 50 feet, and there is beginning to be some prospect of seeing the drifts at the 700-foot level before next season unless the machinery gives out.

"OVERMAN.—Yielding about 100 tons per day, principally from the 400 and 500-foot levels. Cross-cuts at the 225-foot and the 500-foot levels give encouraging indications. No prospecting is at present being done at the lowest levels.

"SEGREGATED BELCHER.—Nothing particularly new or interesting developed, except the assessment of $2 per share levied recently.

"VIRGINIA CONSOLIDATED.—Drift west at the 500-foot level in 71 feet, and excellent progress made. Rock favorable, and no water to contend with.

"KENTUCK.—No new or important developments."

The Nevada *Gazette* gives us this information concerning the Pittsburg mine: "The owners have now eighty-five men, and work is being pushed forward with energy. They are now taking out rock from the 260, 320, 420 and 520-foot levels, and hoisting from both shafts—being equal to working two separate mines. The south drift, from the south shaft, which has cost eight months hard labor and over $10,000, has been completed, and the vein proves as good as ever, being twenty inches in width, and yielding $40 a ton. They are hoisting twenty tons of rock every twenty-four hours, enough to keep their ten-stamp mill in constant operation."

Reports have been coming in from the Greenhorn for the last three days about a very rich strike. It is said that many thousands of dollars have been taken out within that time, and that much more is in sight. That the ledge is very rich no one questions; but that reports have exaggerated the strike there is also no doubt.

Arizona.

By the Prescott *Miner*, Feb. 11, we have the following advices from the mines: "The 10-stamp quartz mill of the *Big Bug* mining company is still in operation, crushing ore from an extension claim of the Eugenie lode, in Big Bug district. L. C. Gray, one of the owners of the mill and mine, arrived in Prescott, recently, with a bar of gold worth between $1,800 and $1,900, the proceeds of about eighty tons of ore. The little mill was less than nine days crushing this ore and producing the above amount of gold. The mine was looking splendid. Mr. Gray is highly pleased. He thinks the result of the next run will be much better, as his superintendent, Mr. McCarthy, had adopted means whereby more gold will be saved. It is the opinion of Messrs. Gray and McCarthy that enough free gold is now lost, per day, to defray the expenses of running the mill. The success of the Big Bug operation—which is now a settled fact—has inspired everybody hereabouts with fresh hope and courage.

"PINE GROVE DISTRICT.

"A couple of weeks ago, some excitement was created by the reported discovery of rich placer diggings near the Bradshaw mountain, and many miners went out there, who, upon examination, found that the diggings were too poor to pay. Some of them then returned to Prescott. Others—some fifteen or sixteen in number—kept on prospecting, and were soon after rewarded for their labor in sinking holes and climbing steep mountains by finding what, in the opinion of many, is the richest gold-bearing quartz lode on the Pacific slope. This ledge is near the summit of the Bradshaw mountain, in a thickly timbered and well watered region. It has been traced a distance of 5,000 feet, and upwards of twenty claims have been located upon it. The rock is partly decomposed, and the gold is, of course, free. We have seen several prospects that were panned out of this ledge, and must say that they were big. Some of this gold was coarse. It is thought that it will yield from two to three hundred dollars per ton in arastras, but this is all speculation. However, we will soon know how much it will pay, as arastras are being erected to test the matter. Other lodes were found, but, of course, none as rich as the one above spoken of. Placer mines were also struck, which, said miners have assured us, will pay to work.

"WALKER'S DISTRICT.

"The miners of this old district are almost tired waiting and praying for water. The same is the case in Hassayampa district. The Sterling mill and Charley Taylor's arastras are in running order, awaiting the flow of the fluid. We have nothing new from Wickenburg and Walnut Grove districts. The placer mines of Lower Lynx creek are bringing in considerable gold, for which our merchants pay $18 per ounce."

California.

A NEW QUARTZ MILL.

An improved quartz mill, called the "Little Giant," is being erected in San Francisco, for the purpose of practically testing its working capacities. The *Bulletin*, March 4, says: "The proprietors claim for it many advantages over any quartz mill heretofore invented, and assert their willingness to contest at any time with a ten-stamp mill. They assert the combining, grinding and pulverizing principle of the Chilean mill, without its slowness, the striking effect of the stamp a perfect discharge, so necessary to prevent cushioning, and a complete confinement of the dust which, when free, acts injuriously on the health of workmen and on the machinery. The mill consists of a strong wooden frame, enclosing all the principal parts of the machinery. There is a horizontal circular iron disk, to which, when the mill is to work, a rotary motion is given. On the face of this disk rest four iron rollers, having a face of eight inches each, and weighing 1,000 pounds each. As the disk revolves these rollers acquire a reverse motion, and the quartz fed between them is rapidly ground to an impalpable powder. The rollers are seventy-two inches round. In each revolution of the bed the rollers will revolve twice, making thirty-four revolutions, which will cause 47,628 inches of iron to strike the rock each minute by one roller; and, by the four, 190,510 inches, with a striking power of 100 pounds to the square inch. A stamp weighing 650 pounds drops one foot, and has a striking effect of only forty-six pounds to the square inch, and this effect is usually greatly reduced by the cushioning of the ore in the mortar, resulting from an imperfect discharge. It drops sixty times a minute, and has a face of thirty-six square inches, making 2,160 inches that come in contact with the rock each minute by a single stamp, and to increase the number to ten stamps, only 21,600 inches are employed against 190,510 inches in the Little Giant, with a striking power of 100 pounds to the square inch, while the stamp has only a power of forty-six pounds. The entire mill weighs about four tons, and is easily transported from place to place. The Cosmus Silver Mining Company, of New York, accepted one of these mills, which, with eight-horse power, pulverizes 1,000 pounds of quartz per hour. The present mill will be in working order in a few days, when miners and others interested in the mineral resources of the State will have an opportunity to witness its operations and judge for themselves of its merits."

Montana.

GOLD IN THE BIG HORN MOUNTAINS.

A correspondent of the *Gazette* says that a party of prospectors have recently returned to Gallatin Valley from the Big Horn country. They report having obtained as high as fifteen cents to the pan on Rose Bud. It has caused quite an excitement among the farmers in that section. If these mines should prove rich and extensive, it will materially aid the farmers of Gallatin county.

MARKET REVIEW.

The Coal Trade.

NEW YORK, March 18, 1870.

Though trade is not remarkably active prices are firm, and there is a general good feeling in the market. This is in a measure owing to the fact that the supply of coal is small and the demand fair. Advices from the mines show that the resumption has been quite general in the Lehigh region. We understand that the old company's men are working on the old basis of $5 at Elizabeth. In the Schuylkill region there was a meeting of the operatives on Friday the 15th inst., representing in the aggregate a production of some 4,000,000 tons of coal. The following resolutions were adopted:

Whereas, All the anthracite coal regions of Pennsylvania except the Schuylkill, are now actively producting, and largely increasing their shipments over those of last year, while we are not only idle, but unable to work and compete with the large corporations of the other regions owning lands, mining coal and controlling the avenues to market, and are therefore deprived of our share in the markets heretofore supplied by us, therefore, resolved.

1. That our true policy is to offer coal at low prices in order to extend the market, increase consumption, and more nearly equalize the demand with the supply.

2. That we approve of the rates of drawbacks allowed by the Reading Railroad Company, thus enabling us to enter the Eastern market as competitors with the large companies shipping from Elizabethport and other points in the New York harbor.

3. That as we produce a better quality and greater varieties of coal than these companies, we can always command the market at equal rates.

4. That in order to retain our trade it is absolutely necessary that each department should be conducted with the greatest economy, and that the workingmen should be satisfied to bear some proportion of the necessary reduction in price, by diminishing their rates and basis of wages.

5. That in view of the present and prospective state of the market, we cannot but regard the basis as offered by the Executive Board of the Anthracite Board of Trade, on March 11, instant, as very liberal, and *more* even than is warranted by the state of the trade.

Namely, when coal is at $2 50 at Port Carbon, wages shall be as follows: outside, $9; inside, $10; miners, $12 per week; contract work to be reduced from present rates, 30 per cent. All advances to be made as before, 20 per cent.

These demands are very reasonable, and the miners must consider them well before they deny them. At the present time coal at tide-water is lower than it has been before for a long time; prices of all articles are low, and will probably go yet lower. For nearly ten years all branches of business have felt the influence of expansion. Contraction is now the order of the day, and though provisions are not as low as they were ten years since, prices of staple articles have fallen from thirty to fifty per cent. within a year. Wages must follow suit, and the miners cannot, by the most complete concert of action, long sustain a contest of this kind. If labor will properly combine and assist capital, we can have coal in this market at prices of about $5 @ $5 50 per ton. And regular work the year round, with a greatly increased production, would pay the miners much better, even at reduced wages, than a succession of strikes, with good pay, for only a few weeks or months of the year, leaving the men idle for the remainder. An adjustment can probably be made more favorably now than at any previous period.

Should the men refuse the offer of the operators, it is reported that a suspension will take place on the 2d of April. Others say that it will be on Saturday, 19th inst.

The snow storm of the present week will probably affect shipments to some extent, as we learn that the roads have been badly blocked by it.

RETAIL. — The retail trade is good, with unchanged prices, and will be likely to continue so till the cold weather abates.

From Philadelphia we learn that the market is quiet, with some few shipments in small lots.

There are many rumors afloat in regard to the action of the Miners' Union. It is stated that Mr. Siney has sent printed notices to the different miners to accede to the operators' prices. If they should not report by Saturday, 19th inst., all the mines will be stopped, and they will not resume until they accept the basis offered by the operators.

Anthracite Coal Trade for 1869 and 1870.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending March 12, 1870, compared with week ending March 13, 1869.

COMPANIES.	1869. WEEK.	1869. TOTAL.	1870. WEEK.	1870. TOTAL.
*Phila. & Reading R.R.	58,589	560,970	5,511	548,870
†Schuylkill Canal				
Lehigh Valley R. R.	48 399	574,081	41,073	715,296
Lehigh and Sus. R. R.	13,568	173,291	14,511	167,786
†Lehigh Canal				
Scranton North	10,328	99.014	11,552	121,421
" South	27,949	297.010	32,084	307,819
Penn. Coal Co., rail	13,545	147,212	16,905	175,742
† " " canal				
Del. and Hudson, rail, N.			10,787	113,072
" " " south			8,081	32,597
Delaware & Hud. Can. N				
" " " S.				
Shamokin	5,903	65,256	3,364	51,749
Trevorton	517	3,558		
Lykens Valley Coal Co.	1,008	7,701		
†Wyoming South				
† " North				
P. N. Y. C. & R. R. Co.			4,972	61,909
Williamstown, Col'y	4,051	18,760	5,892	39,808
Short Mountain	1,443	7,201		
Total	186,200	1,954,824	154,712	2,335,289
1870	154,712			1,954,084
Decrease week and year	31,488		Incr'se	381,205

* Less coal transported for Company's use and Bituminous coal.
† Closed for the Season.

Bituminous Coal Trade, 1869 and 1870.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending March 12, 1870, compared with week ending March 13, 1869.

COMPANIES.	1869. WEEK.	1869. TOTAL.	1870. WEEK.	1870. TOTAL.
B. & O. R. R.	12,206	88,968	6,116	84,118
C. & O. Canal				
H. & B. T. R. R.	4,894	56,935	6,427	40.998
Harrisburg & D.			9,149	25,142
L. V. R. R.				3,310
P. & N.Y. C. & R. Co.			3,871	42,701
	17,400	145 903	25,563	266,267

Schuylkill Coal Trade.

Report of Coal transported via the P. and R. R. for the week ending March 12, 1870—less coal carried for Company's use, and Bituminous Coal:

For week	5,511 03
Previously this year	543,359 06
Total	548 870 09
Same time last year	560,970 00
Decrease	12,100 00
Amount sent same week 1869	58 589 00

Report of coal transported on the Philadelphia and Reading Railroad for the week ending Thursday, March 10, 1870:

From St. Clair	90 14
" Port Carbon	1,348 04
" Pottsville	46 19
" Schuylkill Haven	2,548 15
" Auburn	524 13
" Port Clinton	505 14
" Allentown and Alburtis	146 01
" Harrisburgh and Dauphin	9,148 18
Total paying freight	14,661 01
Coal for Company's use	327 13
Total for week	14.987 14
To same time last year	662,488 05
Total	676,075 15
To same time last year	627,497 12

Harrisburgh and Dauphin Coal Trade.

The following is the amount of Bituminous Coal transported via, the P. and R. R. for the week ending March 12, 1870:

	Tons.
For week	9,148 18
Previously this year	85,993 02
Total,	95,142 00

Report of Coal Transported over Lehigh and Susquehanna Railroad.

Week ending March 12, 1870—Compared with same time last year.

WHERE SHIPPED FROM	WEEK, 1870. tons	cwt.	WEEK, 1869. tons	cwt.	YEAR, 1870. tons	cwt.	YEAR, 1869. tons	cwt.
Wyoming Region	13764	08	8000	09	129260	07	97031	15
Upper Lehigh Region	681	08	2670	11	7005	17	31645	05
Hazleton Region	44	17	96	06	1430	05	1341	07
Mauch Chunk Region	20	16	3200	17	30099	18	43272	11
Totals	14511	09	13968	03	167783	07	173290	18
Increase	543	06						
Decrease					5504	11		
DISTRIBUTION.								
Forwarded East of Mch Chunk by Rail	9358	08	12545	18	150663	14	156085	10
Delivered at and above Mauch Chunk	358	06	696	10	6803	04	6895	14
Delivered to L. & B. R. R. at Plymouth Bridge	4794	15	700	10	10222	09	5468	11
L. V. R. R. at Sugar N.			16	05			4841	03
Totals	14511	09	13968	03	167786	07	172290	18
Of the above there was from Company's Mines.	1005	10	3200	17	38152	11	43272	11
Increase	2195	07			5120	00		
Decrease								

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company, for week ending Saturday, March 12, 1870.

	WEEK.	SEASON.
North	46,857 12	414,381 13
South	8 061 00	32.597 09
Total	54 918 12	446,979 02
Corresponding time in 1869.		
North	40,384 04	358,793 19
South	1,937 07	15,211 17
Total	42.321 11	373,925 06
Increase North	6,473 08	Increase 55,657 14
Increase South	6,123 13	Increase 17,385 12
Total Increase	12,597 01	Increase 73,043 06

Penn. and N. Y. Canal and Railroad Co.

REPORT of Coal Transported via the Pennsylvania and New York Canal and Railroad Company, for week ending March 12, 1870:

	WEEK.	PREVIOUSLY.	TOTAL.
Anthracite	4,971 16	56,937 13	61,909 06
Bituminous	3,871 00	38,830 00	42,701 00
Total, Ant. and Bit	8,842 16	95,767 13	104,610 16

Report of Coal Transported over Lehigh Valley Railroad

For the week ending March 12, 1870, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons.	Cwt.	PREVI'S. Tons.	Cwt.	TOTAL. Tons.	Cwt.
Total Wyoming	9,460	07	143 011	09	152.471	16
" Hazleton	27,719	16	343,094	05	370,722	01
" Upper Lehigh			520	05	520	05
" Beaver Meadow	3,330	04	116,529	15	119,859	19
" Mahanoy	842	11	70,731	18	71,574	09
" Mauch Chunk	19	19	427	18	447	17
Total Anthracite	41,072	17	674,223	10	715,296	07
Bituminous Coal recv'd from Cata. R. R.						
N. C. R. R.						
E. P. R. R.			3,310	00	3,310	00
P. & N.Y. C. & R.R. Co						
Fall Creek						
Schroeder						
Towanda						
Total by rail and canal	41,072	17	677,533	10	718,606	07
Same time last year	48,379	05	525,702	10	574,081	15
Increase			151,831	00	144,524	12
Decrease	7,306	08				
Forwarded East from M'h Chunk by rail	35,355	04	596,035	03	631,390	07
Same time last year	46,948	11	496,530	16	543,479	07
Increase			99,504	07	87,911	00
Decrease	11,593	07				

RECAPITULATION.

Forwarded East from M'h Chunk by rail	35,355	04	596,035	03	631,390	07
To N. C. R. R., at Mount Carmel			115	00	115	00
Forwarded North from L. & B. Junction	4,971	16	56,559	65	61,531	01
To L. & S. R. R. at Packerton for rail	203	08	1,849	13	2,053	01
Delivered at M'h Chunk	21	15	326	00	347	15
Delivered on line of road above Mauch Chunk	141	04	3,226	04	3,367	08
Delivered above M. Chunk for use of L. V. R.R.	379	10	15,456	16	15,836	06
To L. & S. R.R., at P'n Hav., for railroad						
Do. for canal			655	09	655	09
At M.Chunk for canal						
Total Anthracite	41,072	17	674,223	10	715,296	07
Bituminous Coal			3,310	00	3,310	00
Total all kinds	41,072	17	677,533	10	718,606	07

Cumberland Coal Trade.

B. & O. RAILROAD.

The shipments over the Baltimore & Ohio Railroad for the week ending March 12, 1870, were as follows:

From Georges Creek via Piedmont.	Tons.
Consolidation Co	4,136 16
Borden Co	1,057 15
Midlothian Co	
Hamp. & Bait. Co	45 18
From Eckhart R. R.	
C. C. & I. Co.	875 05
Total,	6,115 14

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven	$2 00
From Port Carbon, 8 cents per ton more.	
Less drawback of 80 cents on all Coal shipped east of New Brunswick and south of Cape Henry.	

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Easton	$ 81
C. R. R., N. J., Easton to Elizabethport	1 19
Shipping expenses at Elizabethport	25
Warfage	10
Total	$2 35

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R., or L. & S. R. R. from M. C. to Easton	$ 81
C. R. R., of N. J., Easton to Pt. Johnson	1 19
Shipping expenses	25
Warfage	10
Total	$2 25

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Easton	$ 81
Morris & Essex R. R. Easton to Hoboken	1 19
Shipping expenses	25
Warfage	10
Total	$2 35

TO SOUTH AMBOY.

L. V. R. R.	81
R. & D. R. R.	1 09
Cam. & Am. R. R.	1 09
Shipping Expenses,	25
Total	$2 15

PENN HAVEN TO ELIZABETHPORT.

L. V. RR. Penn Haven to Easton	95
C. RR. of N. J. Easton to Elizabethport	1 19
Shipping expenses	25
Wharfage	10
Total	$2 49

Foreign and Provincial Freights.

March, 1870.

Foreign.

Newcastle and Ports on Tyne, per keel of 21 1-5 tons	£13 10@£14
Liverpool	12s.@15. ton

TO NEW YORK.

Provincial

Sidney	$3 25
Lingan	3 25
Cow Bay	3 25
Port Caledonia	3 25
Little Glace Bay	3 25

TO BOSTON.

Sydney	$2 75
Lingan	3 75
Cow Bay	3 25
Port Caledonia	3 00
Little Glace Bay	2 25

Freights.—MARCH, 1870.

TO EASTERN PORTS.	From Philad'a.	From E. Port and Port Johnson.	From Newburg'h.	From Rondout.
Amesbury	$3 25	—	—	—
Bangor	3 00	—	—	—
Bath	2 75	2 50	—	—
Boston	2 75	2 00	—	—
Bridgeport	1 75	1 00	—	—
Bristol	2 00	1 40	—	—
Cambridgeport	3 00	2 00	—	—
Derby	2 00	—	—	—
Dighton	—	—	—	—
East Cambridge	3 00	2 00	—	—
Fall River	2 00	1 40	—	—
Hackensack	1 95	—	—	—
Hartford	2 75	1 50	—	—
Jersey City	1 75	50	—	—
Middletown	—	1 25	—	—
Mystic	2 00	1 40	—	—
New Bedford	2 25	1 40	—	—
Newburyport	3 10	2 00	—	—
New Haven	1 80	1 00	—	—
New London	2 00	1 25	—	—
Newport	2 00	1 40	—	—
New York	1 25	50	—	—
Norwalk	1 75	1 00	—	—
Norwich and Tow	1 90	1 40	—	—
Pawtucket	2 10	—	—	—
Portland	2 50	2 00	—	—
Portsmouth, N. H.	3 35	2 15	—	—
Providence	2 00	1 40	—	—
Rockport	—	—	—	—
Saco	3 00	2 25	—	—
Sag Harbor	2 00	1 40	—	—
Salem	3 00	2 00	—	—
Stamford	2 00	1 00	—	—
Stonington	2 00	1 40	—	—
Taunton	3 10	2 00	—	—
Warren	—	—	—	—
Washington	1 25			
TO RIVER PORTS.				
Albany	—	1 00	—	—
Catskill	—	—	—	—
Cocksackie	—	—	—	—
Coeyman's	—	—	—	—
Cold Spring	—	—	—	—
Fishkill	—	—	—	—
Haverstraw	—	50	—	—
Hudson	—	—	—	—
New York	—	—	—	—
Nyack	1 60	50	—	—
Poughkeepsie	—	—	—	—
Rhinebeck	—	—	—	—
Rondout	—	—	—	—
Sangerties	—	—	—	—
Sing Sing	1 60	—	—	—
Stuyvesant	—	—	—	—
Tarrytown	1 60	80	—	—
Troy	—	1 00	—	—
West Point	—	—	—	—
Yonkers	—	40	—	—

Prices of Coal by the Cargo,

[CORRECTED WEEKLY.]

	AT NEW YORK, March 17. R. A.	W. A.	AT PHILADELPHIA, March 16. R. A.	W. A.
SCHUYLKILL.				
Lump	$—	$5 00	4 20	4 50
Steamer	— —	5 00	— —	— —
Broken	— —	5 00	— —	4 00 to — —
Egg	5 75 to 6 00	5 25	— —	4 00 to — —
Stove	— —to — —	5 50	— —	4 10 to 4 25
Chestnut	4 20 to —	4 50	—	3 75 to —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump	5 75	— —	— —	— —
Broken	5 50	— —	— —	— —
Egg	5 50	— —	— —	— —
Stove	5 75	— —	— —	— —
Chestnut	5 00	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*	R. A.	W. A.		
Diamond Vein	6 00	— —		
New England	— —	— —		
Locust Dale	W. A. 5 50	— —		
Honey Brook, Le'h	W. A. 4 50 to 5 25	— —		
Spring Mountain "	" 4 50 to 5 25	— —		
Sugar Creek "	" 4 50 to 5 25	— —		
Sugar Loaf "	" 4 50 to 5 25	— —		
Old Comp'y's. "	" 4 50 to 5 25	— —		
Cross Creek "	" 4 50 to 5 25	— —		
Enterprise "	" — —	— —		
Girardville "	" — —	— —		
McMichael "	" — —	— —		
Shamokin "	" 5 50	4 50		
Lykens Valley "	" — —	— —		
Broad Top "	" — —	4 50		
Hill & Harris "	" — —	4 50		
Henry Clay "	" — —	4 50		
Powelton "	" — —	4 50		

Prices for Coal at Mauch Chunk.

	F.L.	Bro.	Gra.	Eg.	Sto.	Cst.
Lehigh	$3 00	$3 25	$3 25	$3 25	$3 75	$3 00
Wilkesbarre	3 00	3 25	3 25	3 25	3 75	3 00

For freight to Elizabethport and to New York see "Freights."

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein, f.o.b. at Phila.	$5 25
" Lemon " "	5 00
Cumberland Vein Coal	5 00
Cumberland C. & I. Co.'s on board, N. Y.	7 50
Central C. & M. Co.'s " "	7 50
Consolidated Coal Co.'s " "	7 50

(*Dealers in these coals may be found in our advertising columns.)

Company Coals.

	L.	Str.	Gra.	Eg.	Sto.	Ches.
Scranton at E. Port	— —	— —	— —	— —	— —	— —
Pittston at N. Y	— —	— —	— —	— —	— —	— —
Lackawana at Weh'kn.	— —	— —	— —	— —	— —	— —
Willi'b're at Hoboken	4 75	4 75	4 75	4 75	5 25	4 50
Old Co. Lehigh at Pt. Johnston	5 50	5 00	5 00	5 00	5 25	4 50
Lehigh at E. Port	5 25	5 50	5 00	5 00	5 25	4 50

For freights to different points, see "Freights."

Prices of Foreign Coals.

March, 1870.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street, New York.

Liverpool Gas Caking	$ 9 50@— —
" " Cannel	10 00@12 00
" House "	13 50@15 50
" " Orrel	13 00@15 00
Per ton 2,240 lbs., ex-ship.	
PRICES FROM YARD.	
Liverpool House Orrel, screened	$16 00@17 50
" " Cannel, "	18 00@20 00
Per ton 2,000 lbs., delivered	

Prices of Gas Coals.

March, 1870.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 43 Pine st., N. Y.

Duty, $1 25.	Coarse. Gold.	Slack. Gold.
Block House	$1 75 @- 75	
Gowrie	1 75 @- 75	
Lingan	1 75 @- 75	
Sydney	2 13½@- 71½	
Pictou	2 13½@1 18¾	
Little Glace Bay	1 50 @1 00	
Caledonia	1 50 @- 75	

AMERICAN.

	Coarse. Currency.	Slack. Currency.
Westmoreland Co	— —	@- —
Despard Coal Co	$8 50	@8 00
Penn	— —	@- —
Newburg Orrel Gas	8 50	@8 00
West Fairmount Gas Coal	— —	@8 00

AT PHILADELPHIA.

Powelton	$7 50

Prices at Baltimore—March, 1870.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$6 00@6 75
Pittston and Plymouth	6 00@6 50
Shamokin Red or White Ash	6 00@6 25
Lykens Valley Red Ash	— —@6 50
Yerba Valley	6 00@6 25
Trevorton, Red Ash	6 00@6 50
By retail, all kinds per ton of 2240 lbs.	7 25@8 50
Georges Creek & Cumberland f. o. b. at Locust Point for shipping	— —@5 00
West Fairmount Gas f. o. b.	6 00@6 50

Prices at Georget'n, D.C., & Alexandria, Va.

March, 1870.

George's Creek and Cumberland f. o. b. for shipping $4 75

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$— —@— —
Lykens Valley	— —@— —
Shamokin Red or White Ash	— —@— —
Trevorton and Yebra Valley	— —@— —

METALS.

NEW YORK, March 11, 1870.

IRON.—Duty: Bars, 1 to 1½ cents ₱ lb; Railroad, 70 cents ₱ 100 lbs.; Boiler and Plate, 1½ cents ₱ lb; Sheet, Band, Hoop, and Scroll, 1½ to 1¾ cents ₱ lb; Pig, 9 ₱ ton; Polished Sheet, 3 cents ₱ lb.

Pig, Scotch No. 1, ₱ ton		33 00@37 00	
Pig, American, No. 1		33 00@35 —	
Pig, American, No. 2		32 —@33 —	
Pig, American, Forge		30 —@31 —	
Bar, Refined, English and American		— —@82 50	
Bar, Swedes, assorted sizes (gold)		85 00@97 50	
	Store Prices.		
Bar, Swedes, ord'y sizes, less 5 ₱ ct.		120 —@130 —	
Bar, Refined	" "	82 50@— —	
Bar, Common	" "	77 50@ 80 —	
Scroll	" "	110 —@145 —	
Ovals and half-round	" "	105 —@115 —	
Band	" "	105 —@— —	
Horse Shoe	" "	105 —@— —	
Rods, ⅞ to 5-16 inch	" "	87 50@130 —	
Hoop	" "	110 —@150 —	
Nail rod, less 5 ₱ ct.		— 7⅛@—7¾	
Sheet, Russia, as to Nos. (gold)		— 11—@—12—	
Sheet, Single, D. and T. Common		— 4¾@— 6½	
Sheet, Galvanized	List 25@30 ₱ cent. discount.		
Rails, English (gold), ₱ ton		58 50@— —	
Rails, American, at Works in Pa.		76 00 @77 00	

STEEL.—Duty: Bars and ingots, valued at 7 cents ₱ lb or under, 2½ cents; over 7 cents and not above 11, 3 cents ₱ lb; over 11 cents, 2½ cents ₱ lb, and 10 ₱ cent ad val. (Store prices.)

English Cast (2d and 1st quality) ₱ lb		— 16 @— 20	
English Spring (2d and 1st quality)		— 7 @— 13	
English Blister (2d and 1st quality)		— 11 @— 18	
English Machinery		— 11½@— 14	
English German (2d and 1st quality)		— 13 @— 15	
American Blister "Black Diamond"		— — @— 12	
American, Cast, Tool	do.	— — @— 18	
American, Spring,	do.	— 9 @— 12	
American Machinery,	do.	— — @— 12	
American German,	do.	— 10 @— 12	

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 20 cents ₱ lb; Manufactured, 45 per cent. ad val.

	All Cash.	
Copper, New Sheathing, ₱ lb	—	@— 31
Copper Bolts	—	@— 31
Copper Braziers, 16oz. and over	—	@— 31
Copper Nails	38	@— —
Copper, Old Sheathing, &c., clean	17	@— 18
Copper, Chili Pig	—	@— —
Copper, American Ingot	19	@— 19¾
Yellow Metal, New Sheating	24	@— —
Yellow Metal Bolts	24	@— —
Yellow Metal Nails	—	@— 23

LEAD.—Duty: Pig, $2 ₱ 100 lbs.; old Lead, 1½ cents ₱ lb; Pipe and Sheet, 2¾ cents ₱ lb.

Galena, ₱ 100 lbs	$— —	@— —
Spanish (gold)	6 15	@6 20
German, do.	6 15	@6 37½
English, do.	6 20	@6 62½
Bar (net)	— —	@ 8 00
Pipe and Sheet (net)	— —	@ 8 00

TIN.—Duty: Pig, Bars, and Blocks, 15 ₱ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₱ cent. ad val.

	Gold ₱ lb.
Banca	33¼@34
Straits	32½@33
English	30¾@31

PLATES.

	Fair to Good Brands. Gold.	*Currency.*
I. C. Charcoal, ₱ box	$8 25 @8 50	$9 75 @10 00
I. C. Coke	7 00 @7 50	8 25 @ 9 00
Coke Terne	5 75 @6 00	6 75 @ 7 25
Charcoal Terne	7 37½@8 00	8 75 @ 9 50

SPELTER.—Duty: In Pigs, Bars, and Plates, $1 50 ₱ 100 lb.

	Gold.
Plates, Foreign, ₱ 100 lbs.	$6 00 @6 12½
Plates, Domestic, ₱ lb.	10 @- 11½

REMARKS.

IRON.—The market for Scotch Pig is quiet, but as the receipts are still light, prices are supported; we notice a sale at Boston of 250 tons Coltness on private terms. There is a little more inquiry for American, and sales have been made of 300 tons No. 1 Thomas at $33@34; and 100 do. No. 1 Allentown, $33, a slight decline on previous quotations. There is a good demand for New English Rails, and prices have advanced to $58@58 50 gold; the sales are 500 tons, 60 lb., English, to arrive, at $58 gold; 650 do. Old Double-Headed and T, $37 gold; 450 do. T, $44 currency; and 200 do. Old Double-Headed, on the spot, on private terms. We learn by Cable that large purchases of New Rails have been made on the other side, and all obtainable to the 1st of July have been taken at advancing rates; market now firm at £7 3s. 6d.@£7 5s. Bar continues very quiet from store at our quotations.

LEAD.—Pig is in very limited demand, and the

market is not strong; we hear of no sales, but quote ordinary Foreign, $6 15@6 20 gold. Bar, Pipe, and Sheet, 8c. net cash.

COPPER.—The manufacturers of Copper and Yellow Metal are steady at the recently revised rates. Ingot is dull and drooping, and prices are very irregular; sales have been made of 75,000 lbs. Lake Superior, at 19@19½c., and 50,000 lbs. Cake and 20,900 lbs. Bar, 19½c. cash.

TIN.—The market for Pig is quiet again, but prices remain firm, holders being strengthened by the receipt of Cable despatches announcing a further advance in London of £3 ₱ ton on Straits, bringing the price up to £123. We quote Straits, 32½c.; Banca, 34c.; and English, 31c., all gold. Since the considerable business in Plates, noted in our last, there has not been much done, and we have only to notice the sales of 500 bxs. ½d. X, to arrive, at a private price. Quotations are unchanged.

SPELTER.—The market for Foreign is entirely at a stand and the price is nominal. "Lehigh" is selling at 11@11½c., and "Am. Zinc Works" 10c. cash.

ZINC.—American, dry, 7½c.; French, dry, 10½c.; Metallic, 9½c.

MANGANESE—OX. Manganese, 4½c. per lb.

Mining Stocks.

NEW YORK, March 18, 1870.

Mining Stocks are more alive with sales of Rocky Mountain at 6c.; Central at 20a24c., and Grass Valley, s3, at 25a26c. Mariposa and other leading stocks show advances in prices.

The Petroleum share list as a whole shows a falling off in prices. Quotations to-day ranged as follows:

	Bid.	*Asked.*
Bennehoff	30	34
Bergen Coal and Oil	40	—
Bliven Oil	25	—
Brevoort	1 00	—
Buchanan Farm	35	45
Central	60	62
Home Petroleum	4 00	4 25
Northern Light	75	1 00
Pithole Creek	1 25	—
Rathbone	25	—
Rynd Farm	31	36
United Petroleum Farms	30	34
United States	71	—

San Francisco Stock Market.

SAN FRANCISCO, March 14, 1870.

There is great excitement in Washoe mining stocks, with general advance in all descriptions of shares in the silver mines of Nevada. Gould & Curry sold to-day at $365, and Savage at $65.

Volcanic Fishes.

IN the year 1803 A. von Humboldt was fortunate enough to witness an eruption of Cotopaxi, a well-known peak, in the northern Andes; during which, among other products, a large quantity of fish was ejected. The inquiries immediately instituted, and the investigations of more recent travellers, have brought to light the astounding fact that, from time to time, though at irregular periods, fishes are cast up from the interior of the mountain during volcanic eruptions. This phenomena is not confined to Cotopaxi; it has been observed also in other centres of volcanic action—to wit, Tungurahua, Sungay, Imbaburn, Cargueirago, etc., all of them in the same range. From the craters of these volcanoes, or from fissures in their sides, it is an ascertained fact that fish are vomited forth at a height of some 16,000 feet above the level of the sea, and about half that height above the surrounding plains. The animals all belong to a single species, the *Arges Cyclopum*, as it has been well named. Nor is it a mere chance fish or two that finds its way to the outer world through this strange opening. They are ejected in such countless shoals that, on more than one occasion, the fetid exhalations proceeding from their putrid bodies have spread disease and death over the neighboring regions. As far as the external world is concerned, *Arges Cyclopum* is known to exist in some lakes on the sides of these mountains 8,000 feet to 10,000 feet above sea-level. It is presumed that these lakes communicate with reservoirs in the interior, where the Pregnadillas are generated, and thus find their way through the crater. But this is mere conjecture. If the internal lakes do not exist, whence come the myriads of fish which are ever and anon ejected? Not the least curious part of the affair is, that though some of the fish reach *terra firma* in a half boiled condition, most of them are perfectly raw, and not a few are even alive, in spite of the fiery ordeal through which they have had to pass. —*Science Gossip.*

The Hagan Process for Treating Ores.

THE following is an explanation of the *rationale* of the HAGAN process for disintegrating and desulphurizing gold and silver ores; Superheated steam is introduced into fire in such a manner that in gaseous form the steam impinges upon the ignited coals or wood, without admixture of atmospheric air, and thus effects the decomposition of water into oxygen and hydrogen gases. The oxygen unites immediately with the carbon of the burning coals or wood, while the liberated hydrogen passes from the fire and burns in the presence of the oxygen in the air. The hydrogen flame and the resulting gases being brought into contact with the heated gold and silver ores, the sulphur, arsenic, antimony, etc., are dissolved, and are carried off with the products of combustion. The powerful effect of the flame of hydrogen, in dissolving pyritous sulphur, arsenic, antimony, etc., and in attacking oxygen, is well known, but the expense of producing it has hitherto prevented its application to the disintegration and desulphurization of gold and silver ores. Not until the invention of Dr. HAGAN'S cheap and simple method of decomposing water, and thus furnishing hydrogen gas and flame abundantly, has it been at all possible to apply it to this purpose. Furnaces are now operating by this process in California which receive charges of sixty tons, and are eminently successful.

Dividends of English Companies.

According to the London *Mining Journal.*

The following dividends were declared during 1869:

BRITISH MINES.

Minera	£35,100	0	0
Great Laxey	28,500	0	0
Dolcoath	24,344	0	0
West Chiverton	24,000	0	0
Devon Great Consols	17,408	0	0
South Caradon	15,360	0	0
West Seton	12,800	0	0
Tincroft	12,000	0	0
Van	12,000	0	0
East Lovell	9,053	10	0
Great Vor	8,862	0	0
Marke Valley	8,550	0	0
Botallack	8,400	0	0
Mining Company of Ireland	8,400	0	0
Providence	6,720	0	0
Foxdale	6,300	0	0
Mwyndy Iron	6,000	0	0
East Pool	5,440	0	0
Trumpet Consuls	5,200	0	0
Herodsfoot	4,608	0	0
Wicklow Copper	4,250	0	0
Frank Mills	4,000	0	0
Penhalls	3,875	0	0
Ding Dong	3,608	0	0
Cook's Kitchen	3,368	15	0
Wheal Jane	3,328	0	0
Mary Ann	3,072	0	0
Bronfioyd	2,600	0	0
Kitty (St. Agnes)	2,577	0	0
West Frances	2,304	0	0
Cashwell	1,920	0	0
Holmbush and Kelly Bray	1,800	0	0
Cwm Erfin	1,734	0	0
South Darrin	1,650	0	0
North Levant	1,500	0	0
South Crofty	1,395	10	0
Cargoll	1,374	0	0
Drake Walls	1,280	0	0
Kitty (Lelant)	1,280	0	0
Prince of Wales	1,280	0	0
East Darren	1,200	0	0
Lisburne	1,200	0	0
St. Just Amalgamated	1,096	7	6
Levant	990	0	0
Pary's	500	0	0
Wheal Mary Hutchins	500	0	0
Spearn Moor	484	0	0
St. Ives Consols	470	0	0
Wheal Margaret	448	0	0
West Great Work	258	0	0
Cwmystwith	256	0	0
West Godolphin	250	0	0
Total	£314,894	0	0

FOREIGN MINES.

Don Pedro	£61,500	16	4
Pontgibaud	17,700	0	0
Vancouver Coal	14,175	0	0
Cape Copper	11,250	0	0
Fortuna	7,500	0	0
Alamillos	7,000	0	0
Linares	6,250	0	0
English and Australian	2,625	0	0
Copiapo	2,000	0	0
Central American	1,500	0	0
Port Phillip	750	0	0
Total	£132,250	16	4

New Application of Baryta.

THE sulphate of baryta is said to possess many advantages over lime as a material for whitewashing walls—4 ozs. of glue is soaked for twelve hours in tepid water, and then placed until it boils in a tin vessel, with a quart of water—the vessel being placed in water, as in the usual process of melting glue, the whole is then stirred until dissolved. Six or eight pounds of sulphate of baryta, reduced to an impalpable powder, is put into another vessel; hot water is added, and the whole stirred until it has the appearance of milk of lime. The sizing is then added, and the whole stirred well together, and applied in the ordinary way whilst still warm.

The New York Harbor Tunnels.

THE bill giving the consent of Congress to the laying tubes or tunnels across the East river, from New York to New Jersey, and making them post roads when constructed, has passed both branches of Congress. The Senate committee amendment, requiring the tunnels to be so constructed as not to obstruct or impair navigation, was agreed to; and also an amendment directing that the work shall be under the direction of the Secretary of War.

DURING 1869, 40,000,000 bushels of coal were shipped from Pittsburgh South and West. This was the production of eighty mines.

MINING COMPANIES AND STOCK QUOTATIONS.

GOLD AND SILVER COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
Alameda Silver		A. Queran, 108 Wall st.	$2,000,000	$10 00		
Ada Elmore	South Boise, Idaho					
American Flag	Nevada District, Col.	P. P. Fullerton, 71 B'way.	600,000	10 00		
Atlantic and Pacific	Humboldt Co., Nevada.					
Bates and Baxter	Colorado			50 00		
Benton	Colorado	W. F. Drake, 15 Broad	500,000	5 00	05	12
Briggs	Colorado	J. P. Davies, 19 Cliff	1,000,000	100 00		
Black Hawk	Colorado	C.T.Whittington, 48 Broad.	2,500,000	100 00	30	37
Bobtail	Colorado	J. Stanton, Jr., 25 Nassau.	1,000,000			
Bullion Consolid'ed Gold	Colorado					
Burroughs Gold	Colorado					
Central Gold					23	25
Consolidated Gregory	Colorado				1 75	1 85
Combination Silver	Nevada			100 00		1 50
Columbia Silver	Austin, Nevada	J. M. Brown, 155 B'way	5,000,000			
Commercial Silver		J. E. Smith, 26 Pine	3,000,000			
Corydon	Gilpin Co., Colorado.	J. Samuels, 40 B'way	500,000			
Downieville	Colorado		2,500,000	25 00		
Eagle Gold	Gold Dirt Dist., Col.	J. P. Davies, 19 Cliff	300,000	1 00		
Empire Gold and Silver	BodieBluff,MonoCo.Cal	H. K. Gates, 70 B'way	1,000,000			
Edgehill		A. Fullerton, 71 B'way	10,000,000			
Esperanza Silver		Ezra Clark, Jr., 13 William.	400,000			
Fisk Gold		H. Johnson, 195 Fulton	500,000			
Forest Queen		E. B. Beet, 62 B'way	1,000,000			
Golconda Gold	Sherbrooke, C. E.	H. Adams, 71 Broadway	2,000,000			
Gregory	Colorado		1,250,000			
Gunnell Gold	Colorado	J. H. Rolston, 80 B'way	1,000,000	50 00		
Gunnell Central	Colorado	C. B. Bostwick, 16 B'way.	3,000,000	10 00		
Gold Rock		R. M. Lockwood, 93 Wall.	400,000			
Grass Valley					25	26
International Silver		J. W. Brazier, 26 Pine	600,000			
Hope Gold	Colorado		5,000,000			
Holman			2,000,000	25 00		
Kipp & Buell	Colorado		300,000			
Knickerbocker Gold		J. H. Rolston, 80 B'way	200,000	100 00		
La Crosse Gold	Nevada Dist., Col.	P. P. Fullerton, 71 B'way.	1,000,000		8	
Lander Hill T. & S.	Nevada	M.L.Catherwood,74 B'way.	1,000,000			
Lewis Gold	Georgia		1,000,000			
Liberty Gold						3
Manhattan Silver	Nevada	M. L. Ogden	400,000			
Maraposa common	California	Jas. H. Ferdon, 34 Wall.	12,000,000		8	9½
Mariposa preferred	California	do. do.			18½	19¾
Montana Gold		G. De Cordova	400,000		3	
Montana M. L. & M. Co.	Montana	A. M. Hoyt, 22 William.	250,000			
Montrose	Clear Creek Co., Cal.	W. W. Perkins, 71 B'way.	1,000,000			
New York Silver	Nevada	Thos. Sproull, 78 B'way.	1,500,000			
New York and Austin	Nevada	E. R. Siccomb, 70 Wall.	500,000			
New York and Owyhee	Owyhee Co., Idaho		1,000,000			
New York and Eldorado		G. H. Munroe, 10 Wall.	2,000,000		10	20
N. Y. & Montana M. & D.	Montana	F. A. Chapman, 20 Nassau.	1,250,000			
N. Y. & Silver Peach	Nevada	R. C. Root, 74 B'way.	2,000,000			
N. Y. & Utah P. & M.		W. H. Mailler, 108 Wall.				
Ophir Gold	Comstock Lode, Nev.	L. C. Warner, 70 B'way.	625,000			
Owyhee Gold		W. H. Smith, 43 Ex. Place.	1,700,000			20
Pahranagat Central	Nevada	J. E. Smith, 25 Pine	6,000,000			
Quartz Hill Gold		F. Bernard	2,500,000		59	64
Reese River Consol'd	Nevada	W. B. Ogden	6,000,000			
Rocky Mountain	Colorado	S. M. Pond, 70 B'way	500,000	10 00	5	6
Rollins Gold		Thos. Bond, 132 B'way	600,000			
Sensenderfer	Colorado	H. A. Shewill, 19 Broad.	1,000,000		₧ 1 00	
Silver Bend		F. W. Macy, 20 Nassau	1,500,000			
Silver Mt. Silver		H. A. Moen, 71 B'way	1,000,000			
Silver Peak & R. M.	Nevada	W. B. Ogden, 52 Wall	5,000,000			
Smith & Parmelee	Colorado	W. H. Hollister, 6 Broad.	2,500,000	20 00	1 45	1 60
Social & Steptoe Con.		T. H. O'Connor, 24 Nassau.	450,000			
Standard Gold		C. B. Bostwick, 169 B'way.	500,000			
Symonds Forks					35	
Twin River Silver	Nevada	J. F. R. Hadden, 20 Nassau.	800,000	100 00		
Texas Gold	Colorado		500,000	10 00		
Union Gold	Colorado	F. A. Potts, 110 B'way	1,200,000			
Wash. Mill & Silver	Nevada	W. W. Perkins, 71 B'way.	300,000			
Wauba Yuma	Arizona	J. W. Silsby, 36 Pine	6,000,000			

COAL AND IRON COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
American Coal Co.		M. A. Myers, 119 B'way	$1,500,000	$25 00		
Ashburton Coal Co		J. T. Rollins, 41 Pine	2,500,000			
Block House Coal		D. B. Keeler, Jr., 43 Pine.	1,000,000			
Brewster Iron		H. Robison, 165 B'way	150,000			
Broad Top Coal & Iron Co	Pennsylvania	B. Love	2,000,000			
Cameron Coal Co		J. A. Simpson, 40 B'way	2,500,000			
Carbon Hill Coal Co		J. Silsby, 36 Pine	1,000,000			
Central Coal		F. P. White, 111 B'way	2,000,000	100 00		
Clifton Iron Co		P. H. Riordan, 34 Pine	1,250,000			
Columbia Iron		F. D. Webb, 77 Cedar	1,000,000			
Consolidation Coal	Maryland	J. S. Mackie, 71 B'way	5,000,000			
Crawford Coal		E. Clapp, Prest, 137 B'way.	1,000,000			
Cumberland C. & I. Co.		E. Kiscan, 90 B'way	5,000,000			30 00
Derby Coal Co		W. S. Davison, 11 Broad				
Dover Coal and Iron Co.		L. Chase, 88 Wall				
Del. & Hudson Canal Co.		R. H. Nerderpol, 7 Nassau.	15,000,000	100 00		
Ebervale Coal		G.L.Stout, Treas.,111 Br'y.	500,000			
Fall River Bituminous		D. T. Blauvelt, 43 Pine	1,000,000			
Farrar Coal		C. H. Jones, 43 Pine	250,000			
Fisher Iron Co		M. Ellis, 19 William	100,000			
Hamp're & Balt. Coal		S. M. Pond, 70 B'way	500,000			
Iron Cliffs Co		C. J. Canda, 52 Wall	1,000,000			
Jackson Iron		G. P. Loyd, 119 B'way.	300,000			
Kemble Coal & I. Co		R. A. Wight, 26 Ex. Place.	300,000			
Keokuk Coal		J. F. Franklin, 112 B'way	100,000			
Lackawanna I. & C	Pennsylvania.	E. C. Lynde, 52 Wall	1,200,000			
Lewis Run C. & I. Co		C. A. Sanborn, 80 B'way	750,000			
Lykens Val. Coal Co		F. A. Platt, 13 William	800,000			
McKean Co. Bit. Coal Co.		J. H. Rolston, 80 B'way	1,500,000			
Lehigh & Susquehanna		E. W. Cark, Philadelphia, Pa.				
Mahanoy			400,000	100 00		
McNeal C. & I. Co		C. C. Godwin, 71 B'way	500,000			
Mount Riga Iron		G. M. Newton, 42 Cedar	300,000			
New Boston Coal		C. H. Ogden, 55 B'way	2,000,000			
N. Y. Con. C. & I. Co		A. T. Levine, 16 Wall				
N. Y. & Lehigh Coal		T. Simpson, 111 B'way	150,000			
Pacific Coal Co		G. Wrighton, 34 Wall				
Peekskill Iron Co		W. Murdock, 7 Nassau				
Pennsylvania Coal Co		E. H. Mead, 111 B'way	3,200,000	50 00		
Richmond Iron Co		C. H. Smith, 165 B'way	1,000,000			
Scotia Coal Co		I. N. Soper, 42 B'way	2,500,000			
Spring Mt. Coal		C. Runyon, 111 B'way	1,250,000			
Springfield & D'p Run C.		E. D. Webb, 77 Cedar	600,000			
Stout Coal Co		G. S. Comstock, 111 B'way.	500,000			
Susquehanna & Wyoming		E. Potter, 40 B'way	1,000,000			
Tannerdale Coal		I. T. Ludlaw, 71 B'way	250,000			
Wash. Mutual Coal		M. C. Baker, 117 B'way	420,000			
West Point Iron Co		R. C. Brock, 110 B'way	500,000			
Wilkesbarre C. & I. Co		W. H. Tillinghast, 80 Br'y.	3,400,000			
Wyoming Val. Coal Co		E. Potter, 40 B'way	1,000,000			20

COPPER AND LEAD COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED
Anita Copper	California	J. A. Ferguson, 8 Wall				
Corinth Copper	Corinth, Vermont	S. H. Howard, 191 B'way	$500,000	25 00		
Davidson Copper						
Eagle Harbor Copper	Michigan.	W. H. Smith, 43 Ex. Place.	500,000	25 00		
Evergreen Bluff Copoer	Michigan	F. W. Caper, 44 Ex. Place.	500,000	25 00		
Globe Copper		R. K. Rickard, 19 Nassau	200,000			
Grand Portage Copper Co		A. S. Kellogg, 22 Pine	500,000			
Guymard Lead		Samuel Vernor, 38 Pine				
Hilton Copper		W. H. Smith, 43 Ex. Place.	500,000			
Hope Copper		J. W. Davis, 19 Nassau	500,000			
Hudson River Copper	New York	T. Clarkson, 22 William	1,500,000			
Indiana Copper Co		J. M. Mills, 25 Nassau	500,000			
Isle Royale Copper	Michigan	F. W. Caper, 44 Ex. Place.	1,000,000			
Keweenaw Copper	Michigan	F. W. Caper, 44 Ex. Place.	500,000			
Lake Superi'r Silver Lead	Michigan	A. S. Kellogg, 22 Pine	1,000,000			
Omiga Copper	Michigan	S. Cooper, 7 Pine	500,000			
Ridge Copper	Michigan	J. L. Gardiner, Jr., 43 Ex. P.	500,000			
Rockland Copper	Michigan	A. Fullerton, 71 B'way	500,000			
St. Joseph Lead	Michigan	J. W. Jones, 6 Broad st,	1,000 000			
St. Marguret Copper		E. P. Sutton, 43 Pine	250,000			
Schoolcraft Copper		R. Walsh, 22 William	500,000			
Superior Copper	Michigan	A. Fullerton, 71 B'way	500,000			
Union Copper		A. S. Kellogg, 22 Pine	500,000			
Vermont Copper	Vermont	J. C. Fly, 191 B'way	500,000			
Wallkill Lead, asst		S. M. Pond, 70 B'way			5	15

MISCELLANEOUS.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
American Zinc Co		W. E. Lawton, 19 Cliff	$1,000,000			
Bigelow Blue Stone Co		H. Bogardus, 14 Pine				
Quicksilver					11	11¾
Covill B. L. M. & M'f. Co		C. B. Bostwick, 302 Pearl	250,000			
Manhattan Marble		H. K. Gates, 70 B'way	300,000			
N. Jersey Zinc Co	New Jersey	A. H. Farlin, 61 Maiden L'e.	1,500,000			

Explosive Materials.

THE lecture, of which the following is a report, was delivered by Professor OGDEN R. DOREMUS, at the Hall of the Young Men's Christian Association, for the benefit of the Soldier's Home in this city.

We are not to forget, the Professor facetiously remarked, that we are living upon an explosive material, that it may at any time explode, and we find ourselves among the flying fragments. Even our own country is not exempt from the convulsions which, from time to time, shake the earth.

Explosive bodies or materials were defined as those prone to swift motion. They are divided into three classes: solid, liquid, and gaseous; but in each there is the same tendency to swift motion.

Gunpowder, one of these substances, is the greatest civilizer of modern times; because the more deadly we make the art of war, the more suicidal it becomes, and the less frequently will it occur. War, however, uses less gunpowder than Peace. The composition remains the same as in the most ancient times—carbon, charcoal, and nitrate of potash—and in very nearly the same proportions as then. Many experiments have been made for the purpose of finding the best wood and the best means of preparing the charcoal from it, but that point is not fully decided.

The fact that powdered carbon will take fire spontaneously, and could not be used in this form, was noticed. Many buildings in this city have been destroyed by spontaneous combustion, which is of more common occurrence than might be supposed. Oil exposed to the air, as when shavings, waste, or paper are saturated with it, has so powerful an affinity for oxygen that spontaneous combustion frequently takes place. The sulphur for the powder comes from volcanoes; and from this fact it was supposed in ancient times that there was something infernal about it. The last material is the nitrate of pot ash, or saltpetre. The use of this substance in the powder is the generation of a great quantity of gas. The fabrication of powder would be an interesting subject for a whole lecture, but the limit of time only allowed the speaker to note some of the more important points. In France the manufacture of powder had made, in some respects, very little advance. For instance, to this day it is the habit in the government mills to mix the materials with wooden mortar and pestle. French powder is, on this account, among the very poorest. It is so soft as to crumble at the least touch, and of course is very disagreeable to handle. Austria makes a beautiful powder. Specimens were exhibited, the grains round and smooth, like shot. Many and very beautiful experiments have been made to determine the rapidity with which powder burns; a very important fact to learn, as different usos require different degrees of rapidity in combustion.

The results of combustion are very curious. Heat is produced, and an immense quantity of gas, at a pressure known in some instances to be as high as 4,000 atmospheres, 60,000 pounds to the square inch. In a vacuum the burning is very slow and requires a perceptible time, the pressure of the air being necessary for the rapid and violent combustion. A small quantity of powder was placed in a small thimble of platinum and suspended in an exhausted receiver. The thimble or crucible was then made hot by an electric discharge, when the powder slowly took fire and burnt with a greenish blue flame, spitting once or twice, but so quietly that no noise could be heard. Gun Cotton, ignited under the same conditions, slowly turned black and disappeared in a cloud, without the least particle of visible fire or light.

It is very easy in a vacuum to ascertain the changes which take place when powder is burned. Nitrate of potash is decomposed, and we have carbonic oxide, sulphide of potassium, and nitrogen. Under pressure, however, the compounds are very different, and almost nothing is known of what really takes place. If we suppose that the powder has absorbed water, which is very probable, almost numberless compounds may be formed. The formulas of a great number were then put upon the black-board by the lecturer.

In firing cannon, the government rule is that the shot shall just touch the powder, and no more; as it has been found that the effect of the powder is wonderfully increased when the shot is driven down sharply, so as to compress the charge, and the effect of this increase was feared. On this account it was ordered that the shot should merely touch; but further experiments prove that when gunpowder is compressed, the ball is sent with more speed, while the strain on the gun is diminished materially. With an elongated charge of condensed powder—an air space being left all around the charge in the box—it is found that the strain upon walls of the the gun can be reduced from twenty-five to fifty per cent., while at the same time the initial velocity of the ball is increased. These effects increase with the amount of condensation, till a maximum in velocity and a minimum in the strain are reached. This is of great value to all using powder, as it enables them to produce the precise effect which they wish. The condensed powder has various other advantages which were then mentioned. A thousand of these elongated charges of condensed powder have been fired from a French gun without swabbing. This number of charges is usually considered a gun's life-time; but, as far as could be seen, the gun was safe to blast as many more.

This condensed powder is sometimes made in the form of hollow rods, which are very convenient for blasting, as any number can be put into the hole till the charge is sufficient. These rods are used to a great extent in the tunnel under Mount Cenis, where they are found to be more economical than powder in the ratio of five to eight.

Gun-cotton was the next topic taken up. This substance is found by the action of a mixture of strong nitric and sulphuric acids upon cotton, or in fact upon starch, fine sawdust, flax, paper, and a great number of similar substances, from which we may obtain, not strictly gun-cotton, but gun-starch, gun-sugar, gun-paper, gun-flax, etc. Pyroxaline is the name given to all these substances, they being the same in chemical composition. Cotton cloth can be so treated that the moment the hot iron of the laundress touches it, it shall vanish in a flame. This gun-cotton is much more powerful than powder, but the uncertainty of composition makes it of little use for military purposes.

Owing to the fact that the nitrate of potash, used for gunpowder, is to be had in great quantities from India only, attempts have been made to obtain a substitute. The French chemists proposed the chlorate of potash; but it was found on trial to be too easily exploded, friction, and even a jar being sufficient. During the rebellion, an attempt was made to take advantage of its superior explosive qualities by moistening the cartridges with a solution of this salt. It was speedily abandoned on account of the danger attending it, but before the cartridges so made could be destroyed, seventeen persons lost their lives by explosions among them.

Another expedient was to produce an artificial supply of the nitrate. This was much more successful, as the extensive European nitre beds show. Col. HAZARD, (a most appropriate name for a powder maker!) advised that this government should import in time of peace, and keep constantly on hand in the interior of the country, thousands of tons of the nitrate of potash, in order to have an accessible supply in case of a war with any power controlling the supply of this article. The next division of the subject was liquid explosions. First in rank among these stands the famous nitro-glycerine, a substance prepared in a manner very similar to that by which gun-cotton is made. Glycerine, the pleasant oily sweet liquid used so extensively as a toilet article, is the base from which this explosive material is made—the only difference in composition being that an atom of water is replaced by an atom of nitric acid. Several experiments were there performed with the nitro-glycerine, showing that, properly used, it was not so dangerous as its misuse has led us to suppose. Experiments were there narrated, going to show that it was reasonably safe in vessels of all the common metals except *iron* and *tin* combined, which would invariably produce decomposition of the material and an explosion, sooner or later. This, the speaker thought, was the secret of many of the fearful explosions. The nitro-glycerine has almost invariably been stored in *tin cans*, (of sheet-iron covered with a thin coating of tin,) where it was scarcely possible that the liquid should not come in contact with both metals. The speaker thought the government should prohibit the transportation, or storing of nitro-glycerine in tin vessels.

Water was alluded to as an explosive agent, especially when very hot or very cold—frozen or in steam boilers. The "spheroidal state" would probably account for a part of the explosions, but a large part are still involved in mystery. A tallow candle might be made explosive by allowing the gas from the glowing wick to be suddenly ignited. This was shown by plunging a smoking candle into a jar of oxygen gas where the candle was lighted from a spark remaining in the wick and the smoke exploded with a slight report. The explosive mixtures of different gases formed the next department of the subject. The gases were capable of forming the most explosive of all compounds. Some examples were then shown of the power with which common street gas explodes when mixed with oxygen. Some hints in regard to seeking for leaks in gas-pipes were then given and it was strongly urged that the sense of smell should be the chief dependence. The methods of producing explosions were enumerated, as friction, heat, electricity, chemical action, etc. The lecture was listened to by a large and select audience who greeted the speaker with frequent applause.

The National School of Mines.

THE following is the text of the Bill to Establish a School of Mines, introduced in the Senate of the United States, February 24, 1870, by Mr. STEWART, of Nevada, read twice, referred to the Committee on Mines and Mining, and ordered to be printed.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Treasury is authorized and directed to establish a Mining School for the diffusion of correct knowledge in relation to the practical application of science in the opening and working of gold and silver mines, and the best methods of extracting the precious metals from ores containing the same.

SEC. 2. And be it further enacted, That until otherwise provided by law, the Mining School hereby established shall be located temporarily, at one of the mints or assay offices of the United States.

SEC. 3. And be it further enacted, That for conducting said Mining School, there shall be appointed by the Secretary of the Treasury, subject to the approval of the President of the United States, a comptroller, a professor of chemistry and metallurgy, and a professor of mining engineering. The comptroller shall have the supervision and direction of the Mining School, under general regulations approved by the Secretary of the Treasury. The professors authorized to be appointed under this act, shall perform such duties as may be prescribed by the comptroller.

SEC. 4. And be it further enacted, That the salary of the comptroller shall be four thousand five hundred dollars per annum, and to the professors the sum of four thousand dollars, each, per annum, shall be allowed.

SEC. 5. And be it further enacted, That for carrying into effect the objects of the Mining School hereby established, including the purchase of scientific works on chemistry, assaying, metallurgy, and mining engineering, for the use of said school, and for procuring and erecting suitable fixtures and apparatus for conducting the necessary experiments in the treatment of gold and silver ores, the sum of fifty thousand dollars is hereby appropriated: *Provided*, That no part thereof shall be expended except on estimates first submitted to and approved by the Secretary of the Treasury, and for all expenditures vouchers duly certified by the comptroller and transmitted with a quarterly statement of account, to the First Auditor of the Treasury.

SEC. 6. And be it further enacted, That it shall be the duty of the officer in charge of the mint, or assay office, at which the mining school may be located, to assign to the officers of the mining school, suitable apartments for the performance of their respective duties, and allow the necessary use of the machinery, furnaces, and assay implements, and apparatus: *Provided*, That the same do not interfere with the legitimate operations of said mint, or assay office.

SEC. 7. And be it further enacted, That the lectures and experiments at said school, shall be open and free to all citizens of the United States, without charge, under such regulations as may be presented by the comptroller of the school, and approved by the Secretary of the Treasury.

SEC. 8. And be it further enacted, That the persons to be employed under the provisions of this act shall take an oath or affirmation for the faithful and diligent performance of the duties of their respective offices; and the Secretary of the Treasury may require them to give bond and surety in such sum as he may deem proper.

SEC. 9. And be it further enacted, That a record shall be kept in the comptrollers's office, of all experiments and assays made at said school, and the comptroller shall make from time to time such reports in relation to the operations and conditions of the school as may be required by the Secretary of the Treasury.

Obituary.

DIED—On Tuesday, March 1, FRED. D. WELLS, in the 34th year of his age.

The above announcement will deeply grieve a large number of the patrons of this journal, resident in Jersey City and Hudson City. Mr. WELLS was greatly beloved by all who were so fortunate as to know him; and the inscrutable providence which has cut him off in the prime of life, just as his hopes of usefulness, success and happiness were about to be realized, it is difficult to contemplate with resignation. Mr. WELLS was born in Huntington, Conn., in 1833. At an early age he left h country home, to seek his fortune in the busy world and amid the scenes of city life. He was engaged until 1858 in mercantile business at New Haven and Bridgeport, in each of which places he won the esteem of employers and friends by his manly deportment and prompt fidelity. But his energetic temperament led him to long for more rapid advancement; and New York seemed to be the only place that offered him full scope for the exercise of his talents, industry and perseverance. Accordingly, in 1858 he removed to this city, and here, as elsewhere, he soon gathered about him a circle of warm friends and admirers. Fortune smiled upon him; and only his great liberality, which made him a natural benefactor to the suffering and the needy, prevented him from accumulating considerable wealth. As it is, he has left behind him but little earthly merchandize, having preferred the treasures incorruptible, and the precious legacy of an honorable fame. In 1860, Mr. WELLS married the eldest daughter of STARR BEACH, Esq., of Bridgeport, and the union was blessed with two daughters, who now join the bereaved widow in mourning the loss of a Christian father and husband. He was also active in the labors of the church; and his associates will long have reason to miss the ready sympathy, zeal and judgment with which he enriched the resources of the good cause.

The writer of this notice knew him as a friend and brother; and it is difficult for him, in recalling the many excellent qualities and good deeds of the deceased, to confine himself to words that shall not appear exaggerated in the eyes of strangers. The publishing house of WESTERN & COMPANY was indebted to Mr. WELLS for constant friendship and assistance during its early days. In every department of life which his activities touched, he has made a mark upon the memory and gratitude of men; and the family, the friendly circle, the church, the brotherhood of Masons, and the greater brotherhood of the poor, all bear affectionate remembrance of him. We must mourn his early loss; yet his career, incomplete as it was, illustrates well the almost Christian saying of the heathen philosopher: *Breve spatium vitæ satis longum est ad bene beateque vivendum*—the brief space of life is long enough for right and blessed living.

Government Mine Inspection in America.

THE draft of an admirable Bill for the regulation and inspection of collieries has been prepared by the representatives of the miners in the county of Luzerne, Pennsylvania. The Bill comprises the most thorough regulations for the ventilation of mines. It imposes extra precautions for the use of furnaces for that purpose, and excludes them from mines with a single shaft. It makes two distinct shafts an imperative necessity, and provides for double air-courses of ample size in all mines. The sections relating to hoisting apparatus, mode of ascent and descent, construction of carriages, etc., point us strongly to the Diamond Mine disaster of March, 1868, as do the previous portions of the Bill to the late horror at Avondale in 1869. The most careful inspection of boilers and machinery is to be required, and additional watchfulness is to be exacted from engineers and their attendants. A better class of skilled labor is called for in this responsible department, and boys under 20 years of age are not to be employed in charge of any mining machinery. No boy less than 12 years old is to be allowed to work in mines, or even enter them. The Bill creates the office of General Inspector for the county, with a salary of £800 a year, to be paid from the State Treasury. He is to have had sufficient experience in working and ventilating mines containing fire-damp, and is to make an annual report to the Governor. There is to be a deputy-Inspector, at £300, and a clerk at £160 per year, the total annual expense for securing the execution of the law being limited to £1,400. The Bill, as a whole, is regarded as fair and equitable between employer and employed.—*London Mining Journal.*

THE ENGINEERING AND MINING JOURNAL.

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ROSSITER W. RAYMOND, Ph. D., Editor.

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THE ENGINEERING AND MINING JOURNAL *is projected in the intent of furthering the best interests of the Engineering and Mining public, by giving wide circulation to original special contributions from the pens of the ablest men in the professions. The careful illustration of new machinery and engineering structures, together with a summary of mining news and market reports, will form a prominent feature of the publication.*

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Dualine Again.

AN article from the *Journal of Applied Chemistry*, quoted by us last week, asserts that dualine is in several respects inferior to dynamite—in particular, that it will not stand water; and an anonymous correspondent of the *Artizan* attacks it with considerable smart sarcasm. The latter has considerably overshot his mark. He says that "a microscopic examination of dualine reveals sawdust, crystallized over with nitre, and moistened with nitro-glycerine." We doubt whether such a determination can be accurately made with a microscope. Crystals of nitre may be indeed recognized, and flakes of sawdust; but these can be found in dualine by the much simpler process of looking at the patent, which is probably the method of microscopic examination pursued by this writer. The whole communication is characterized by so much hostility as to be unreliable.

Now, we are not partisans for dualine. We never used any of it, and we know very little about it. But we like to see fair play; and we mean to do our best to secure it for this explosive and its inventor. Lieut. DITTMAR did not "leave NOBEL'S nitro-glycerine works when they blew up;" he was called to rebuild, enlarge and manage them *after* they were blown up by his predecessor; and he comes to this country too highly endorsed and recommended to be successfully assailed as a charlatan. It is well known that while he was in charge of the NOBEL works, dynamite was made known; and it is believed that Lieut. DITTM.. ; discovered it, though Mr. NOBEL is the patentee. This matter still awaits judicial decision.

The correspondent of the *Artizan* ridicules the specifications of Lieut. DITTMAR'S patent; and it must be confessed that these are not satisfactory. The experience of the patentees of nitro-glycerine and dyamite has been, that it is almost impossible to protect a patent when the substance can be so easily manufactured, if all the process is clearly described in the specifications. We suspect that in the present case, the inventor has kept secret a part of the necessary manipulations. It may consequently be both dangerous and fruitless for private parties to attempt to make dualine for themselves; but that does not prove the worthlessness of the material when properly manufactured.

If Lieut. DITTMAR desired to engage in the manufacture of dynamite or nitro-glycerine, we should think, judging from the statistics of his manufactory abroad, that he might effect great economical improvements in that direction; and if he does not attempt this, it would appear that he sincerely believes dualine to be better than either. The difference between the apparatus employed by him in Charlottenburg, and that in use at the Hoosac tunnel, for instance, is that the former produces in ten minutes 250 lbs. of nitro-glycerine, for which the latter requires twenty-four hours. We are informed that the dualine manufactory which he is now completing near Boston will have an initial capacity of 10,000 lbs. daily.

The principal advantages claimed for the dualine over nitro-glycerine are its indifference to ordinary changes of temperature, and its non-production of unpleasant gases. It is also claimed to be unaltered by moisture. These qualities, as well as the general effectiveness of the explosive, are attested by numerous mining superintendents of Germany, and by a few experiments already made in this country. It is reported that the contractors of the Hoosac tunnel will employ this material exclusively hereafter. Under these circumstances, and on the eve of a decisive verdict from actual practice in the United States, articles condemning dualine in advance, especially from anonymous sources, seem to us uncalled for, and more likely to be the desperate expedients of rivals, than the calm opinions of experts.

The Best Protection for Labor.

PROTECTIVE tariffs, however beneficial to special industries, are considered by all parties as temporary expedients. The true and permanent protection of labor is education. The superior condition of American workmen is mainly the result of their superior productiveness. The use of machinery reduces the amount of manual labor, and enhances its value, because it requires labor of a higher quality. The man who manages a machine must know more than he who simply handles a tool. This is curiously illustrated in Europe. Russia, paying a dollar or a dollar and a half per week to workmen in her iron-works, nevertheless has to protect herself against the iron of Germany, which pays still more; Germany protects herself against Belgium, where wages are higher yet; Belgium has, until very recently, been in danger from England, where the wages of skilled labor are highest of all. But English manufacturers are now alarmed at this gradual loss of European markets; and it is generally acknowledged that the cause is the superior technical education now given on the continent to workmen. Aside from all temporary or artificial protection, we believe that the great intelligence and universal education of American mechanics, together with the unequalled natural advantages of our country, will place us, and keep us, at the head of the world.

Let every workingman bear in mind, that no combination, no protection, no capital, no temporary advantage can be half as valuable to him as his own brains and hands. Superior intelligence will tell, in spite of all obstacles and delays. It is the most convenient, portable, easily stored, safely insured and certainly profitable of all treasure or stock in trade. Nothing but lunacy or death can take it away from a man. Other people may cheat him out of what he has in money or property; the elements, the fluctuations of trade, a thousand things may make him bankrupt in outward wealth; but no one can cheat him of what he knows: fire and water, currencies, financial catastrophes, all leave a man's intellectual investments uninjured. Next to a good conscience and a pure life, there is nothing like a trained and well-stored mind.

This sounds as familiar as a sermon; yet how many are there who habitually act upon it? Do not men appear to exhaust their ingenuity for means to increase their wages—willing to do anything for higher pay, except to deserve it? Our Trades Unions are too frequently abused by shiftless workmen, who think it easier to *demand* wages than to *earn* them. Good mechanics are injured and disgraced by such association. The climax of folly was recently reached by a foreign Union, which required of its members an oath, that they would never seek to become employers, but always remain laborers, at such wages as the society should fix. American labor, we trust, will never seek to be "protected" by such tyranny.

Mining Statistics.

THE report of the Commissioner of Mining Statistics has been presented to the Secretary of the Treasury, and will doubtless be immediately transmitted to Congress. What that body will do with it remains to be seen. Last year, the House of Representatives ordered fifteen thousand copies of the report for 1868 to be printed for free distribution. Of these, one thousand were for the Treasury Department. This thousand, we undestand, have all been distributed; but what has become of the other fourteen thousand it is not so easy to say. Complaints have reached us from many quarters, that it is impossible to obtain the report. Perhaps the complainants have applied to Senators, instead of Representatives. The Senate ordered no extra copies. But it would seem that fourteen thousand ought to be enough to supply the demand; and we think a little perseverance may yet discover in Washington some forgotten store of them.

Concerning the private edition, about which some western papers have made severe reflection, as if the Commissioner got it out in advance of the other, and sold it for his personal profit, Mr. RAYMOND desires to make the following statement, which it will be an act of justice for the press of the mining States and Territories to copy or notice. There was an edition of five hundred copies printed at the expense and risk of J. B. FORD & Co., a prominent publishing house of New York. The paper and binding were superior to those of the large government edition, and it was supposed that this fact would sell the small edition, which differed in no other respect from the public document. Mr. RAYMOND spent five weeks in Washington, urging in every possible way the immediate printing of his report, and reading the proofs at all hours of the day and night, to expedite the work. The sheets for the private edition were printed at the same time with the rest, and sent to New York after the whole government edition had been printed. Nothing was left to be done but the binding. This was completed by the New York house for the small edition in a week, and by the United States bindery for the large edition in about three months!

Mr. RAYMOND'S whole connection with the private edition amounts to the receipt of twenty-five copies from the publishers—a courtesy for which he is the more grateful, since the government never gave him any. The earlier appearance of the private edition is a matter which he could not foresee and did not in any way influence. Finally, the publishers of this journal made an arrangement with J. B. FORD & Co., by which they could furnish applicants at the ordinary price with copies of that book. There are a hundred or so of the volumes left, and WESTERN & Co. will be quite happy to continue to supply them, trusting that, after this plain statement, the Commissioner's connection with the matter will not be misunderstood.

The Eureka of Grass Valley.

WE note that the celebrated Eureka Mine, of Grass Valley, with all the plant and machinery, has been bought, or rather contracted for, by the Eureka Mining Company, Limited, of London, at £250,000 sterling. On this sum the mine has paid twenty-six per cent. per annum for the last three years, and during the year ending September 30th, 1869, the profit of the mine was $361.211, or $72,242, nearly twenty-nine per cent. on the price for which the property is now sold. At the same time, the reserves of the Eureka are exceptionally large. There is no reason for the apparently low price paid, except that which applies to all mining, especially of the precious metals. A mine ought to pay from twenty-five to forty per cent. on its valuation. The Eureka of Amador county was sold in 1868 for $750,000, on which it was paying thirty-six per cent. at the time! Yet capitalists go on paying for undeveloped and unknown properties, sums larger in proportion than are commanded in the market by actually producing and profitable mines. We do not wonder that they lose their money. The capital of the new Eureka Company is £260,000. Mr. WILLIAM WATT, the present efficient manager of the mine, will, we are glad to see, retain that position under the English administration.

A National School of Mines.

WE publish elsewhere the text of a bill to establish a School of Mines, introduced in the Senate by Mr. STEWART, of Nevada. This measure provides for a very modest school, with a comptroller, a professor of mining engineering, and a professor of metallurgy, to be located, temporarily, at some mint or assay office of the United States. We presume there is no doubt that the Carson mint will be chosen, if the bill passes; and indeed we do not think the fine building and superfluous room of that establishment could be put to a better purpose. At the same time, the means of instruction provided by the bill appear to us quite inadequate to the importance of the objects proposed. It is not so good a plan as that which the distinguished Senator formerly presented. But that failed, and this may pass. "If you must, you must; man is but dust; when you can't get bread, you must e'en take crust!"

Bitumen and Coal in Texas.

LETTER FROM PROFESSOR ROESSLER.

CABINET OF PRACTICAL GEOLOGY AND MINING,
U. S. GENERAL LAND OFFICE,
WASHINGTON, D. C., March 10, 1870.

TO THE EDITOR: SIR—From several sources information has reached this office that there existed on the Texan shores of the Gulf of Mexico a deposit of bitumen. One very recent account also described a journey from Vera Cruz to a locality from whence considerable quantities have been obtained and used in Mexico, also near the coast. Within a few days a specimen of this valuable material was received at this office from the Texas deposit, and it proves to be a genuine bitumen, not distinguishable from that of Trinidad or Barbadoes. The substance is found in hardened cakes, in unlimited quantities, around springs, in low, marshy situations. When first discharged with the water of the spring, it is combined with much volatile matter, and is fluid, but a short exposure to a semi-tropical sun dispels the gaseous or liquid portions, and it solidifies in dense black masses, such as are seen in commerce. Inasmuch as similar phenomena are noticed on the Pacific coast, in corresponding latitudes, and as it is now traceable through Mexico, Texas and the West Indies, as far East as Trinidad, the inference is admissible that a vast belt of petroleum or bituminous bearing rocks exist along the whole line, from the Pacific and across the Carribean Sea.

The substance is used in enormous quantities for city pavements, roofs, cements, and in any situation where a perfectly water-tight construction is required.

From Young county, in Texas, the office has received numerous specimens of true coal, including the bituminous and anthracite varieties. The geological reconnoissance of the State, in 1859-1861, under Dr. B. F. SHUMARD, detected their occurrence in the vicinity of Fort Belknap, and assigned them to their true place in the regular coal series. Subsequent reports on the same subject, by Dr. FRANCIS MOORE, after a superficial examination, pronounced the deposit to be lignite, of tertiary origin. This is evidently a serious geological mistake; for the associated rocks are sandstones, limestones, conglomerates and shales, such, in fact, as only belong to the true carboniferous formation. The extent of it in the State of Texas reaches at least to 600 square miles, and has an estimated thickness of three hundred feet. The calcareous or argillaceous schists filled with coal plants, and an unmistakable array of fossils belonging to the animal kingdom, leave no doubt as to the true nature of this coal, and which may be traced through corresponding coal formations in Missouri, Iowa, Kentucky, and Illinois.

The existence of anthracite in Texas is a new discovery, but not such a one as to excite doubt. But a short time since, a similar announcement came to us from New Mexico, and is now a well known and accepted fact. There is no difficulty in believing that wherever beds of coal are intruded into the trap or basaltic rocks, the heat and other metamorphic agencies accompanying such rocks, will expel the volatile matter from bituminous coals and convert them into hard or anthracite coal. Because it has been done in Pennsylvania is no reason why it cannot be done anywhere else—but rather a hint to look for it wherever the same geological conditions are found existing together. The modern sequence to the discovery of coals is that a railroad shortly penetrates the district; the Memphis and El Passo road can obtain abundant supplies from these deposits.

A. R. ROESSLER.

American Mining and Metallurgy from a Foreign Standpoint.

Notes of a Tour of Observation, by Professor F. STAPFF, of Sweden, Special Correspondent of THE ENGINEERING AND MINING JOURNAL.

VII.

ECONOMICAL ITEMS.

THE following notes are almost entirely based upon figures published by Professor S. WATERHOUSE, in a pamphlet entitled, "The Natural Adaptation of St. Lonis to Iron Manufactures: St. Louis. 1869." This pamphlet is connected with another: "The Resources of Missouri," which, being published at the request of the State Board of Immigration, must be considered as a quasi-official document. Moreover, the high respectability of the author, and of the iron-masters quoted by him, must remove all doubt of its correctness.

Though the following notes, based upon previously published statements, cannot offer great interest to your American readers, I would be glad to see them printed in your paper, that they may in some measure satisfy the curiosity of many of your European readers.

Professor WATERHOUSE has expressed some costs in gold rates and others in currency, the gold premium in the later case being accepted at 35. But this premium having steadily declined, I think it will be most convenient to express here all prices, etc., in coin values.

The following prices were (1869) paid in St. Louis and vicinity:

WAGES AT FURNACES.

Furnace manager,	$1,480 00 per year	Helpers	1 66 per day.
Founder	1,330 00 "	Fillers	1 48 "
Engineer	130 00 pr mo'h	Cindermen	1 48 "
Keepers	1 95 per day.	Other workmen	1 30 "

Materials, except Ore, Coal and Lime.—Common red brick, $5,18 @ $5,92 per M. at Carondelet; hearthstones, refractory sandstones, from a quarry close by Carondelet, $1,07 per cubic foot. A full set, consisting of thirteen pieces, costs in place, $185. Fire-brick, made of refractory clay, dug five miles from St. Louis, cost, delivered at the works, $29,63 per M.

COST OF PRODUCING PIG-IRON.

I. *At Irondale, Mo.—Charcoal Iron.*

ITEMS.	QUANTITY per ton of pig-iron of 2,268 lbs.	COST IN GOLD. at furnace.	per ton iron made
Charcoal—actual amount consumed in furnace, 133 bushels, of 2,600 cubic inches; amount by r ceiver's measure (showing waste to be about 10 per cent.) bushels...	1.48	$0,059	$8,77
Ore—Iron Mountain (64 per cent. of iron) tons	1.55	2,111	3,27
Ore—Hematite, red, 45 or 50 per cent., sometimes used with Iron Mountain ore, per ton, $3.89.			
Ore—Pilot Knob, richness about 50 per cent., sometimes used with Iron Mountain ore, per ton $2,19.			
Limestone—Magnesian, 1 to 10 of ore			0,15
Labor and superintendence of every kind, except that relating to and already estimated in the cost of coal, ore and limestone..			4,76
Materials other than coal, ore and limestone			0,67
Taxes, national, State, and county			0,24
Total cost in gold of one ton of pig-iron			$17,86

II. *At Carondelet, Mo.—not Kingsland's furnaces.*

1.50 tons of Iron Mountain ore, at net cost of	$4.08	gold per ton				$6.12
1.22 "	Big Muddy coal,	"	"	3,89	"	4,74
0.30 "	Connelville coke,	"	"	6,67	"	2,00
0,37 "	limestone,	"	"	0,67	"	0,25
0.08 "	mill cinder,	"	"	1,85	"	0,15
Labor						4,08
Interest, taxes, and insurance						1,11
Total cost in gold of one ton of pig-iron						$18 45

Formerly the cost of producing iron at Carondelet was about $20,74, and it is expected that it will, by and by, be reduced to $11 @ $15 gold.

From these computations, showing the price of Iron Mountain ore at Irondale, eleven and a half miles from Iron Mountain, to be $2.11, and at Carondelet, sixty-eight miles from Iron Mountain, $4.08, it appears that the freight for iron ore on the St. Louis and Iron Mountain Railroad, must be 3,5 cents per ton per mile (4,7 cents currency when gold was 135). The distance between Pilot Knob and Irondale being seventeen miles, a ton of Pilot Knob ore will cost $2,19—(17.$0,035)= $1,60 gold, at Pilot Knob. On page 26, of "The Resources of Missouri," we find: "Ore yielding 56 per cent. of pure iron can be bought at Pilot Knob for $1,50 (currency) per ton. At St. Louis the price is $3,50 (currency) per ton. Of course the freight between Pilot Knob and St. Louis, would be $2 currency for a distance of 86½ miles, or $2,31 cents, currency, per ton per mile. At gold rates ($1,35) the equivalent figures are: Pilot Knob ore at Pilot Knob, $1,11; at St. Louis, $2,59; railroad charges per ton per mile, $1,71 cents.

The cost of Big Muddy coal at Carondelet is composed of:

Net price delivered in barges per ton, gold	$3,15
Cost of unloading per ton	0,18
25 per cent of slack "	1,11
	4,44
Value of slack at half-price	0,56
Total cost of one ton of Big Muddy coal	$3,89

III. *At "One of the largest Iron-works at Pittsburgh, Pa.,"* (I suppose SCHONBERGHER'S):

1½ tons of ore, yielding 66 per cent. of iron, $8.15 per ton	$12,22
80 bushels of coke, at 5.19 cents per bushel	4,15
½ ton of limestone at $1,85 per ton	0,62
Labor	2,96
Interest and taxes on $148.000 invested for an annual product of 20,000 tons of iron	0,59
$3,700 per year for repairs and inidentals	0,18
Total cost of one ton of pig-iron (gold)	$20,72
For ores containing but 57 per cent. of metal, add ¼ ton more ore.	2,04
Total	$22,76

IV. *At the Mahoning works, Youngstown, Ohio.*

I quote from a letter of Messrs. BROWN, BONNELL & Co.: "In our manufacture of pig-metal, we use about three-quarters of Lake Superior and one-quarter of native ore to the ton of pig. The Lake ore costs, delivered at our furnaces, about $9, and the native ore $3 per ton. Black-band ore, yielding about 50 per cent. of iron, costs $5 per ton. The coal costs about $2 or $2,50 per ton. It takes 2¼ or 2½ tons of coal to reduce one ton of metal. The limestone used as a flux we get delivered to us at $1,125 per ton, and the whole cost of making one ton of pig-metal is about $25. All these rates are currency.

For making up a schedule of cost out of these rather incomplete items, I will suppose the average yield of the ore to be 55 per cent; 1,38 tons of Lake ore and 0,45 tons of native ore will then be used to one ton of pig-metal. Ore yielding 55 per cent will take about one-third of a ton of lime per ton of metal reduced, and—as the mean of 2¼ and 2½ tons—2,375 tons of coal. For labor, I calculate, as an average, $3,86 per ton of metal, and for taxes, interest, etc., I add 5 per cent. of the cost preceding. The computation, *expressed in gold*, will be as follows:

Ore—1.38 tons Lake Superior, at	$6,67	$9,20
Ore—0.45 " native "	2.22	1,00
Coal—2,375 tons "	1,67	3,97
Lime—⅓ " "	0,83	0,28
Labor		3,86
Interest, taxes, repairs, incidentals, 5 per cent. of preceding $18,31		0,92
Total cost in gold of one ton of pig-iron		$19,23

Or $25,96 currency when gold is 135.

V. To supply the means of determining the relative cost of making iron, the following data, obtained from a leading manufactory in Johnstown, Pa.,* are submitted by Professor WATERHOUSE:

Per cent. of iron in ore	36	Cost per ton of calcined ore	$5,00
" fixed carbon in coke	78	" " labor	4,90
Cost per ton of coal	$1,30		

The other elements are not given. From these dates we can derive the approximate cost of pig-iron, knowing than one ton will take 2.8 tons of ore and about 3 tons of coke, or 4.44 tons of coal, (the coal making 45 per cent. of coke when coked in heaps); and that commonly no limestone flux is required at Johnstown. Here, also, I have transformed the above currency rates into equivalent gold rates, and for interest, taxes, etc., have calculated 5 per cent. of the cost for the rest. The account of the cost of the product will be:

Ore—2.8 tons at $3,70 gold	$10,36
Coke—2 tons, corresponding 4.44 tons of coal at $0.96	4,26
Labor	3,63
Interest, taxes, repairs, incidentals, 5 per cent. of preceding, $18,25	0,91
Total cost in gold of one ton of pig-iron	$19,16

The cost of making iron at Johnstown, Pa., Brazil, Ind., Massillon and Youngstown, Ohio, varies, according to Professor WATERHOUSE, from $25 to $33 currency, or $18,52 to $24,44 gold per ton.

Some economical statements of Professor WILBUR, recently reported by the Missouri *Republican*, essentially differ from those made above, and candor requires that both sides should be stated. I have turned the currency rates of this authority into gold at the premium of 19.

Present market price for American pig-iron, $27,73 @ $29,41 per ton; best quality, $35,30. Actual cost at Carondelet, (Kingsland's furnaces):

Fuel per ton of pig-iron	$10,08	Brought over	$21.93
Ore	7,37	Add—Transport to market	$1,68
Lime	0,28	Commissions	1,05
Labor and incidentals	4,20	Interest	0,42
	$21,93		3,15
		Total cost	$25,08

At Brazil (Indiana):

Fuel	$7,06	Add	3,15
Ore (Iron Mountain)	13,86		
Lime	0,42	Total cost	$28,69
Labor, etc.	4,29		

The difference between these figures and those given above, though great, is partially but an apparent one, some costs here being added which do not appear in the former calculations, because they concern the *selling* of iron, and not strictly its *fabrication*. Besides, it should be taken into consideration that all prices, when expressed by gold rates, necessarily must shift in inverse proportion with the gold premium, for their amount in currency does not daily rise and fall with this premium. (The first calculations concern a premium of 35; the latter a premium of 19.)

At thirty-seven furnaces in the Lehigh, Schuylkill, and Susquehanna regions, the cost of making one ton of pig-iron was $24,90 average for the last six months of 1869.

Statements recently published, that iron is made at a cost of $18,50 per ton, are unreliable. St. Louis, from her proximity to ores and coals, can make the best iron at the lowest rates.

It seems at least clear that the *present* cost of making pig-iron is, on the average, $2,32 lower in the Mississippi valley than in the Eastern States. For the future, a yet greater difference must be expected—the iron industry of the Mississippi valley being yet quite young. Its increase, almost independent of a successful struggle with Eastern and European competition, seems to be a mere question of consumption of hardware in the West and of capital invested upon this industry. The freight from Pittsburgh to St. Louis is about $7,50 by rail, and half as much by river; from Cincinnati, by river, about $3; from Philadelphia, $12 to $13—all per ton in gold. The first and poorest product of the Carondelet furnace brought $24,44 a ton; the later yield has commanded from $25,11 to $31,11 (gold) a ton. These figures need no explanation. The harmlessness of English imported iron to the Missouri iron industry may be observed from the following statement:†

Cost per ton of Scotch pig at Glasgow (1868)	$12,50 gold.
Commissions	0,31 "
Insurance to New Orleans	0,16 "
Freight to New Orleans and primage	4,00 "
Cartage and commissions at New Orleans	1,11 "
Freight from New Orleans to St. Louis	2,96 "
Insurance	0,29 "
Scotch pig (cheapest kind of iron made in Europe), duty free, at St. Louis	$21,33 gold.
Government impost	9,00 "
Total	$30 33 gold.

The price of puddling iron per ton is, in:

New England	$3,70 gold.	Western Pennsylvania	$5,00 gold.
New York	4,08 "	Western States	5,55 "
New Jersey	4,44 "		
Eastern Pennsylvania	4,44 "	Average price	$4,53 gold.

In comparison, the average price of puddling iron in England is $2,375 gold; in Belgium, 1,20 (?) gold.

The average weekly earnings of puddlers are as follows:

United States	$16,54 gold.	Belgium & Rhenish Prussia	6,00 g'd.
England	8,75 "	Russia (Vicksa Iron-works)	1.93 "
France	8.00 "		

The mean price of American rails is per ton: At Johnstown, Pa., $55,55 gold; at St. Louis these rails will cost $64,62, when shipped by rail; $61,29 when shipped by river (from Pittsburgh). Now it is claimed that, at present rates, the rolling mills of St. Louis can make rails for $51,85 gold a ton. The price of English rails, delivered at St. Louis, varies generally between $57.77 and $59 gold a ton. The cost of importation may be seen from the following account:

Rails per ton at the works	$28,75 gold.
Commissions	0,71 "
Insurance to New Orleans	0,39 "
Freight to New Orleans and primage	6,50 "
Cartage and commissions at New Orleans	1,11 "
Freight from New Orleans to St. Louis	3,70 "
Insurance	0.55 "
English rails, duty free, imported to St. Louis	$41.71 gold.
Government impost	15,68 "
Total	$57,39 gold.

Of consequence, as far as rails cannot be made at St. Louis for less that $41 @ $42 gold, the manufacturer will not earn other profits of his rail-mill than the Government impost as a premium. We see here an example, how dangerous it may be, to treat questions of tariff on general philosophical principles merely. In the present instance, by a reduction of duty on pig-iron, the American iron-masters will be forced to energetic improvements, which must enable them to earn profits at their establishments equivalent to those which they now owe to the high tariff. With natural resources, surpassing in amount and easy accessibility those of all the known world, and with wages only 50 or 60 per cent. higher than the English wages, America *must* come to make pig-iron at almost the same cost as England. Then no special protective duty will be necessary, since the freights from England hither will for ever warrant a high and certain profit to the American establishments.

As to iron rails, we find, on the contrary, that they cannot now be made in this country with reasonable profits, if the manufacturer is not allowed a premium in the shape of rather high duties on foreign rails. Of course, these should be kept on until reasonable reductions be justified by lower prices of home-made pig-iron. The latter being essentially dependent on reductions of the pig-iron impost, a change of the tariff as to rails by and by, also, will be suitable. But the duty on rails cannot be lessened so speedily, nor in quite the same scale, as that on pig, and I believe that many years will elapse before it ought to be annihilated.

* NOTE.—Cambria Iron-works?

† NOTE.—A similar schedule was communicated from the Missouri *Democrat*, in a former letter; the price of Glasgow iron there being stated at $11,50; and freight to New Orleans, $4,84; freight to St. Louis, $3,32, remaining cost the same as here. Total cost at St. Louis, duty free, $21,53; with addition of Government impost, $30,53 (all gold).

Wyoming.

THE SWEETWATER MINES.

A correspondent of the Omaha *Herald*, writing from South Pass City, Feb. 22, gives the probable yield of some of the mines which have not been worked in mills, and which are now undergoing development:

"The Barnaby is a well-defined ledge, is easily traced for half a mile on the surface, has an open cut on the brow of a hill, where it was first discovered, thirty feet long and forty feet deep, and shows a vein of pure, rich quartz four feet wide, and exhibits considerable fine free gold. In addition to this 800 feet from the cut, it has a shaft 54 feet deep, and shows a vein five feet wide, nearly every particle of quartz showing free gold, and from all appearances, and by miners' tests (hand mortar and pan), will yield $40 per ton, at an expense of $12 per ton to mine and mill—a pretty good profit. The Duncan is a large and well-defined ledge, about 200 feet south from the Barnaby, has a tunnel 40 feet long, together with a shaft 30 feet deep, shows a vein six feet wide, has considerable decomposed quartz, which yields one dollar per pan. The Duncan and Barnaby lodes are without doubt two as valuable ledges as our camp can boast. The best evidence of the richness of the camp is this: when strangers visit our city they are not beset by a parcel of worthless scamps trying to sell mines at cheap rates. The universal content among the miners and their pleasant faces is conclusive evidence of this fact. Whenever a man offers a mine for sale at small figures, you may take it for granted his mine is worthless. I was told that a communication from your valuable paper in relation to sales being made of wild cat ledges, or, as they are called here, *merion* ledges, was re-published in one of the Chicago papers, and has caused quite a commotion among the quartz sharks of that place. This will please a majority of the miners here, as there is no affinity between these gentlemen in the least. Before I close I cannot help giving you the actual results of the two last clean ups from the Cariso ledge, from quartz 95 feet deep, as weighed at the express office, from 30 tons of quartz crushed in 52 hours, 183 oz. and 3 dwts., making $3,760. The last clean up was from 12 tons of quartz which yielded $3 per oz. of gold (24 hours run,) making $1,760 at an expense of $25 per ton for mining and milling. Bear this in mind; no expensive furnace or acids were used, nothing but plain quicksilver to amalgamate the gold with the quicksilver. Your readers may wish to know the state of society up here in the mountains. I have lived or travelled in most of the States and Territories of the Union, and in no place have I found more intelligent and gentlemanly men than the miners and citizens of the Sweetwater mines. We have our weekly social club dance, attended by fair women and brave men. We also have one female magistrate, who, for dignity of appearance and soundness of judgment, would do honor to some of our superior courts. One thing we are free from here, is the genus "rough." There is something in the atmosphere of a well regulated mining camp at the present day that does not agree with these gentlemen's habits. There are several gentlemen here who imitate the lamb in one respect—that is, they "gambol," here all resemblance ceases; but there has never been a single case of pocket-picking or garroting in the camp."

Utah.

A correspondent of the Omaha (Neb.) *Weekly Herald*, writing from Salt Lake City, Feb. 18, says: "Since writing my last letter, I have seen a silver brick from Meadow Valley, a mining camp about 300 miles from this city. This brick is valued at $1,200, and was accompanied by others, in all valued at $3,000. The ore from which these bricks were extracted seems to be different from that which is found hereabouts, as it is susceptible of being 'milled.' The Legislature, I believe, has enacted a mining law. I have not seen it, and know not its provisions, but the fact of its passage is evidence to fortify any previously expressed opinion that the 'authorities' here would interpose no further opposition to mining operations. Hence, you may rest assured that the ball will roll in earnest the present year. At Brigham, a mining camp about twenty miles from this place, parties have been at work all winter doing something. At that place is found coarse gold. I saw a small nugget, and heard of one weighing three ounces and over. The weather still remains pleasant, though a little frosty for a few days past."

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" Dividing of, but not into "separate and and distinct" current (plans)
" Crossings (see H on plans)
" Weight of in shafts
" How to find the weight of
" Table of pressure in shafts
" Expansion of
" Its velocity and force
" Rush of, into each division
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" Splitting, why the workmen object to Mr. Hopton adopting the mode
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Coal, several ways of working it out, and why man methods of working it out are adopted
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Dials, several engravings
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" At Lund-hill, in what part of the mine it was supposed to take place (plan)
" How the power may be diminished
Furnace, how to find the horse-power of
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" Engravings of ground floor, front and back view
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" (Carburetted hydrogen) do.
" Choke damp and carbonic acid, not one and the same in quality
" The effect produced on people by inhaling such
" The quantity required for an explosive mixture
" The elasticity of
" The weight of
" The nature and quality of
" Why some mines generate and produce more than others
" Why some mines generate a mixture of
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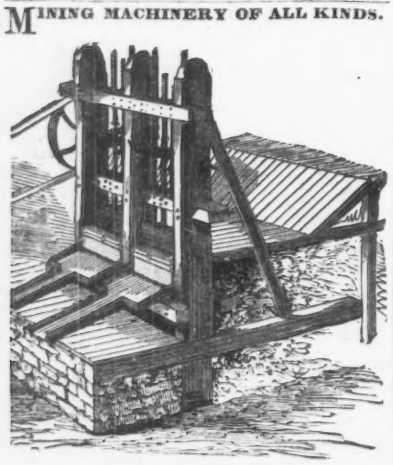

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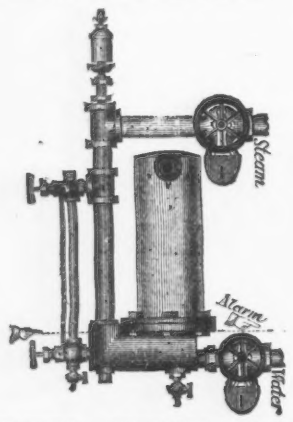

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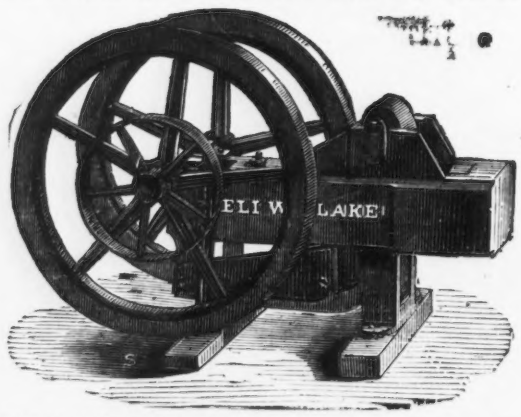

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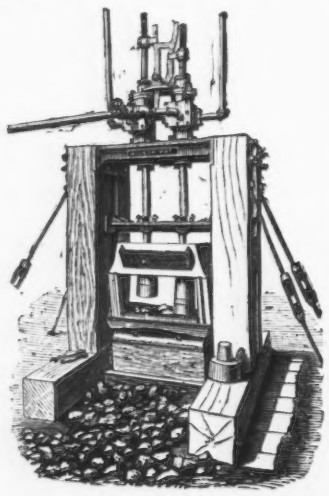

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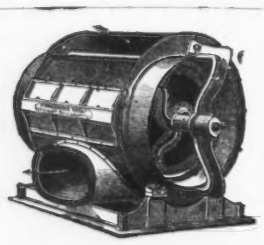

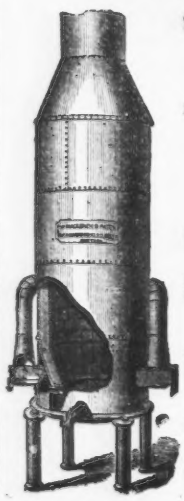

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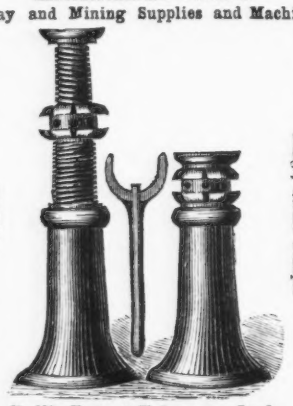

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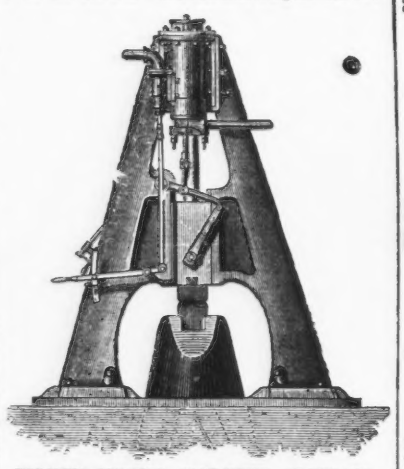

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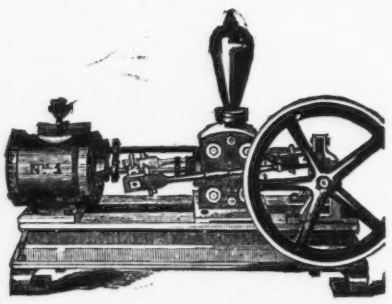

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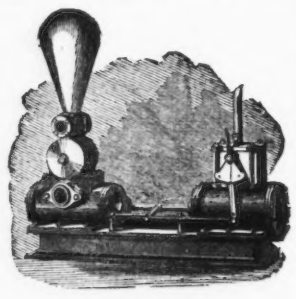

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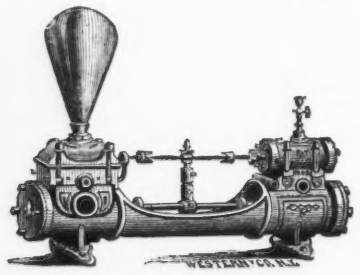

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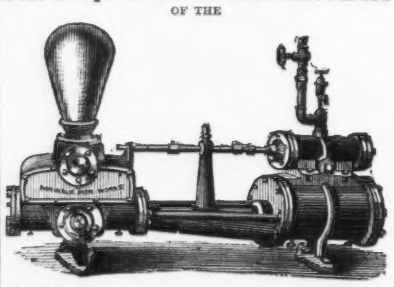

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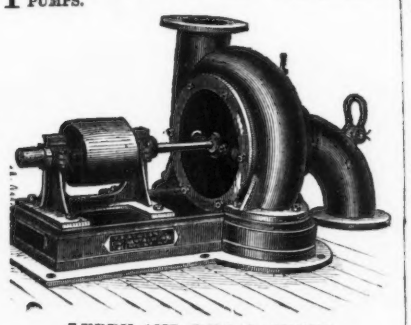

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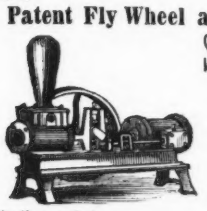

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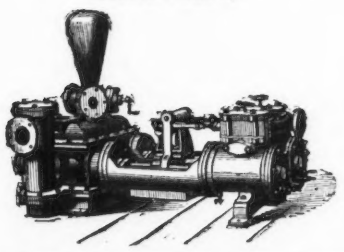

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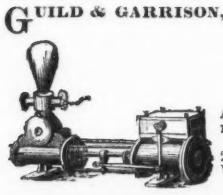

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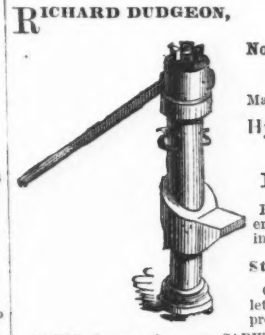

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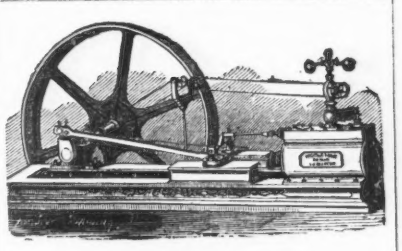

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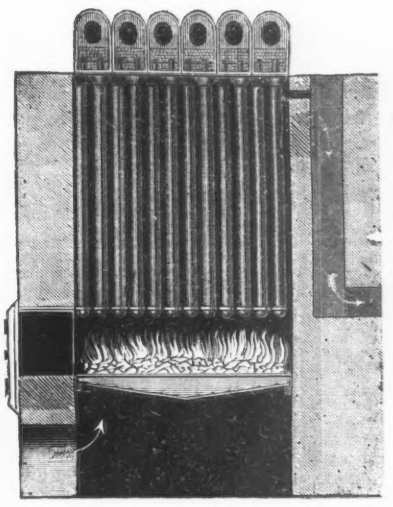

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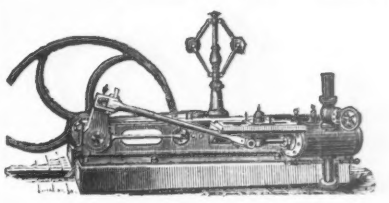

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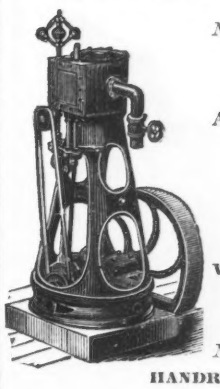

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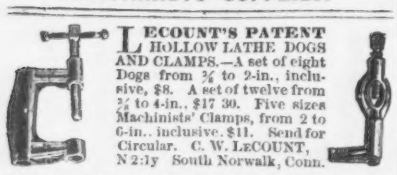

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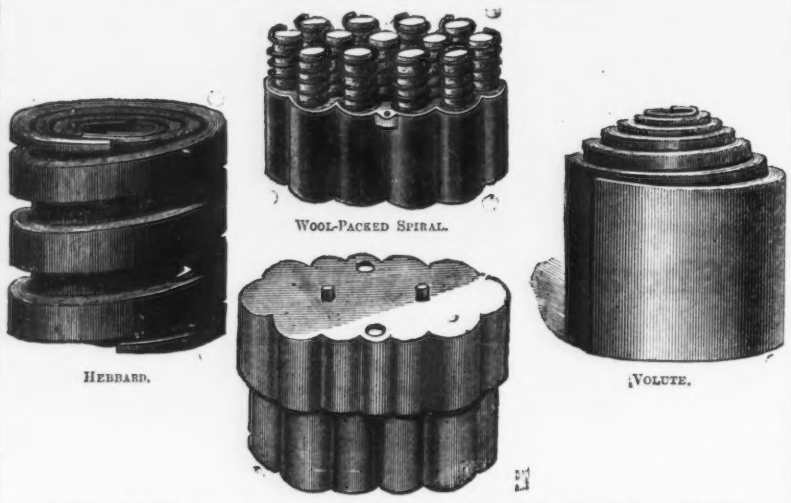

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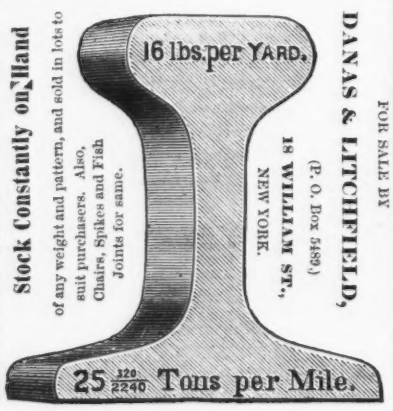

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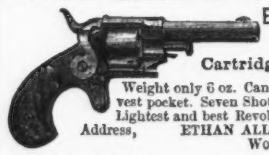

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